



SATURDAY, AUGUST 17, 1872.

Contributions.

Wanted, a Bridge!

TO THE EDITOR OF THE RAILROAD GAZETTE:

"Sealed proposals will be received until 12 o'clock noon, August 1, 1872, for building a bridge across C River, between A and B.

"For information, relative to length of spans, etc., apply to
"JOHN SMITH, A."

An honest bridge builder, who visits the locality in quest of information, finds that John Smith & Co. have employed no engineer, have drawn no specification, and, as a natural result of their ignorance of bridge detail, have shrouded the whole affair in inscrutable mystery.

Information can generally be obtained as to length and arrangement of spans, width of roadway, etc.; but these, not unfrequently, are found to be badly disposed.

As to such minor details as the load to be sustained, factor of safety, and general character of the proposed structure, the utmost indifference is displayed.

"What kind of a bridge do you propose, gentlemen," asks our honest builder, "wood, combination or iron?" "That is exactly what we do not know," reply John Smith & Co. "What we want is a good bridge. We did think, at first, that we should be obliged to build it of wood, but since we are offered an iron structure at such slightly advanced cost, we think, perhaps, that we shall but consult our interest by erecting a life-long bridge of iron. There have been some new iron bridges recently erected in X County for a very reasonable consideration, and we are going over to examine them."

If it occurs to our honest bidder that the training of John Smith & Co. has hardly been of a character to fit them to determine whether an iron bridge is correctly proportioned or not, and that their examination will probably point more to the architectural effect and ornamentation of the structure visited than to its detail and proportion of parts, he had best keep his opinions to himself. He may, perhaps, suggest that a general specification be drawn, indicating the load to be sustained, the factor of safety, and the general character of the structure. He will probably say, "It will be quite as easy, gentlemen, for you to determine at this time, as at the letting, what kind of a bridge you want; and by doing so, you will save yourselves and bidders much unnecessary labor. To enable you to do this, it may be stated approximately that the cost of a wooden bridge, for your purpose, proportioned for a rolling load of 2,000 lbs. per lineal foot, with factor of 5, will be so much. The cost of a combination bridge, of same strength, may be 30 per cent., and that of an iron bridge 100 per cent. in excess of this figure. The relative advantages of the different kinds of bridges are so and so."

If these suggestions are acted upon, it is the exception rather than the rule. John Smith & Co. wish it to be understood that they are not altogether green at bridge building; they are wary and crafty. These statements are all very well; but doctors differ, and they have received contra statements from other builders, who, in all probability, were mechanical charlatans, well endowed with speech withal, to whom the enforcement of a carefully prepared specification would be utter annihilation.

The day of letting having arrived, our honest builder submits his strain sheet and plan, only to find that his explanation of elementary and well-established principles is regarded as an ingenious argument in favor of his particular bridge; and the award is made fully 40 per cent. below his figure, in favor of a structure whose proportion of parts (if given at all) would cause a shudder to the honest profession.

Our honest builder does not attend the next highway letting, and the charlatans have it all their own way.

Who that is familiar with the detail of highway bridge letting can say that fair dealing and intelligence are generally more characteristic than in the case which has been cited? With much regret be it said that ignorance and cupidity, upon the part of commissioners and others having the letting of highway bridging in charge, have given birth to and fostered a kindred spirit among a faction of mechanical tricksters, who style themselves bridge builders, and, under this cover, prey upon the public safety.

In a recent number of the RAILROAD GAZETTE, Charles A. Smith reviews an iron structure at Groveland, Essex County, Mass., which he pronounces criminally light in proportion of parts, and details some account of the actual failure of a portion of it. This bridge, doubtless, belongs to that fearful and wonderful class of structures which separates the builder and designer from honest men. Instances are not wanting, however, in which the proportion of parts is much more slight than that which Mr. Smith describes, to say nothing of the utter failure, in some cases, of these ill-fated structures. At the present day, when iron highway bridging is as yet in its infancy, it may not be invidious to inquire what is the probable life of an iron structure in which the constituent material is frequently strained up to its elastic limit. If it is not likely to prove a more profitable investment than a wooden structure proportioned with conventional factors of safety, by all means let us have the latter.

Referring to the cause which has fostered the practice of proportioning bridges insufficiently, it has been stated as the direct issue of cupidity and ignorance upon the part of those having the lettings in charge. It is believed that but a small

portion of the evil can be charged to corruption, and when it is considered that years of study and experience are required to fit the engineer and bridge-builder for his duties, it may not be a matter of surprise, and should in no wise be considered a matter of discredit, that the highway commissioner is not an adept at the science of bridge-building. He must adopt the alternative of employing a competent engineer, or run the risk of being swindled by the bridge sharper.

It generally happens that confidence in self and distrust of engineers (which perhaps in some cases is not without cause) lead to the latter result. It is to a correction of this evil that attention is invited, and it is the wish of the author of this paper that other writers may be led to express themselves upon this subject, which must be possessed of interest to all who value life and limb. Might it not be possible that some legislation, pointing to general results, could be obtained to bear upon this question, and with quite as much propriety as that bearing upon the safety and inspection of steam boilers?

For example, let it be generally specified that every highway bridge shall have a proportion of parts, throughout, which shall enable it to carry, in addition to its own weight, a rolling load at least equivalent to 65 pounds per square foot of floor area, without causing a strain upon any tensile member greater than 12,000 pounds per square inch of effective section if iron, or 800 pounds per square inch of effective section if wood, nor a strain upon any compressive member greater than one-fifth the ultimate strength of such member; floor beams to be of iron or wood, as may be specially indicated, and all floors to be proportioned for an accidental load of 100 pounds per square foot of floor area, with factor of 5; in iron bridges the floor beams to be attached in such manner that no transverse strain be thrown into the chords.

There are of course many other points which should be covered by specification, such as thickness of planking, character of fences, quality of material and workmanship, painting, etc., but if no further information be given than has been above cited, with the arrangement of spans, width of roadway, etc., the public safety would thereby be greatly enhanced, and honest competition would be induced.

By making public exhibition of the plans submitted, at a letting, the shortcomings of any bidder who has failed to conform to essential features of the specifications will be made transparent. It will be always desirable, however, that a competent engineer be employed by those who have the letting in charge.

As highway bridge lettings are now conducted, it may be stated as a general fact that bridge-builders of acknowledged reputation do not respond to invitations to bid unless the invitation be accompanied by a specification of unusual character or some special assurance of fair dealing. The general character of the responses to the invitation to bid on the Chemung River Bridge at Elmira, and the habit of ignoring highway-bridge lettings in general, seems to indicate that reputable builders only require some assurance of good faith to induce them to risk the hazard of the die. There certainly seems to be no reason but that Elmira should have a good bridge—in fact, one contractor offers to build a bridge better than a good bridge.

The publishing of the bids upon this bridge in the RAILROAD GAZETTE, while it did not seem to indicate that amount of wisdom among those who are considered our best builders which belongs to the wise, showed up in woeful plight the code of bridge morals belonging specially to the class who hold the laws of statics in defiance.

While the faults which have been touched upon exist to some extent in railroad bridging, the case is by no means so general. In iron bridging, the practice of specifying the load to be carried, the quality of material to be employed, and the factor of safety, leaving the design of the bridge and its detail to the builder, has generally given good results, and it may be inquired why the same method may not be made to apply in the case of wooden or combination bridges. If the Howe is the best form of truss for railroad purposes, the remark is invidious; but the writer has been long convinced that such is not the case. There is at least one form of truss, the double triangular, and there may be others, which possesses decided practical advantages over the Howe. It is believed that the considerations which induced its adoption for the superstructure of the Kansas City bridge may be made to apply in every case in which wooden or combination bridges are required.

The most usual forms of bridge trusses are the Howe, in which the braces are diagonal and ties vertical; the Whipple or reversed Howe, in which the braces are vertical and ties diagonal; the quadrangular, in which the braces are vertical and ties diagonal, the latter reaching over two panels; and the double-triangular, in which the braces and ties are at the same angle.

In addition to these are the Post, Fink, triangular and Bollman trusses.

It may be generally stated that, with a given rolling load, span and factor of safety, these several systems may all be made to have the same strength; but a comparative analysis of strains, and incident proportion of parts, will show a vast difference in their relative economy, will indicate that the Whipple, quadrangular, Post, Fink and Bollman systems are essentially applicable for iron bridges; the triangular and double-triangular for iron or wooden bridges, and the Howe, for wooden bridges only.

In proportioning an iron Whipple bridge for a long span and heavy load, it is found that the end panels require larger sizes of material than it is convenient to employ; hence have come into more general use the other systems which have been mentioned, and in which this difficulty is not experienced in the same degree. Similarly in the construction of wooden Howe bridges, the same difficulty is found to exist. Even for a span of 150 feet, if the rolling load is specified at 3,000 pounds per lineal foot, with factor of 6, as is sometimes done, the end panel becomes a matter of gross dimensions; so much so that the builder is very apt to shirk its requirements a little for the sake of obtaining convenient proportions of scantling and

round iron. The writer has yet to see a Howe bridge conforming faithfully with the specification given above.

In the double triangular bridge the span and rolling load may be increased considerably beyond the figures named, before any difficulty is experienced on account of gross sizes of material. This fact, taken in connection with care of adjustment and symmetry of appearance, class the system far ahead of the Howe, as it is believed any engineer will admit who will examine its analysis of strains and general detail.

There are several bridge-building firms who are so far convinced of the merits of the system that they build it in preference to the Howe, for about the same price per foot, whenever permitted to do so, and invariably give better satisfaction than with the latter.

As before stated, the writer is convinced that the system is better applicable to the general requirement for a cheap and substantial wooden railroad bridge than the Howe; but as the advocates of the latter are, as a general rule, so loyal to their choice, and frequently somewhat biased in their views, he would value a disinterested opinion upon the subject from an engineer who has made comparative analyses of all approved truss systems and is familiar with the best detail for the same. He would also like to have an advocate or builder of the Howe bridge state what rolling load and factor of safety he considers it desirable to employ for spans of 150 feet, and the actual weight per foot for a bridge so proportioned, the weight of oak timber, if any, being taken at four pounds and pine timber at three pounds per foot B. M.; the size of the end rods and end scantling, and whether the rods are apart, welded or plain.

The writer has just been informed of the letting of a wooden highway bridge (Howe truss) in which one of the spans, 130 feet in length, has two rods 1 1/2 in. in diameter, in the end panel of each truss. The bridge has one twenty-foot roadway and one six-foot sidewalk, both being covered with 3 in. plank. It is believed that the weight of the bridge can not fall short of 1,100 lbs. per lineal foot. It is not known whether the ends of rods are enlarged before cutting the threads; but assuming that such is the case, and adopting the weight of 1,100 lbs. per lineal foot, it appears that the strain upon the end rods due to the weight of the bridge only, is slightly in excess of 8,000 lbs. per square inch. Assuming the bridge to be covered with the moderate rolling load of 2,000 lbs. per lineal foot, the strain upon the end rods, becomes 23,000 lbs. per square inch.

It is respectfully submitted whether this may be regarded as a safe structure in which ordinary traffic seems likely to strain the constituent material beyond what are considered conventional limits, and when it be remembered that occasional loads are liable to collect upon it, in the form of crowds of people who may assemble to witness a boat-race, follow a circus, caravan or a fire-engine—the latter, perhaps, when the floor is covered with a heavy fall of wet snow—it becomes an open question whether this bridge should not be classed as dangerous.

It may be remarked that the committee who had the letting of this bridge in charge were advised of the deficiencies of this particular design, and that there was at least one other design submitted which was honestly proportioned. They appear, however, to have been governed by the laws which so commonly regulate highway bridge lettings, rather than by the laws of statics.

BRIDGE.

A Union Depot for Chicago.

TO THE EDITOR OF THE RAILROAD GAZETTE.

The introduction of each new line of railroad into Chicago opens the discussion of the question of advantage and disadvantage and of damage to private property, out of which arise speculations as to the most desirable means of accomplishing the object, so as to cause the least damage. Railroad corporations are sometimes a little indifferent as to the means used, so the end sought be accomplished; the city desires to open all facilities consistent; the State, the same; and yet there are private rights to protect which both are bound to look after. Having given the subject some consideration, I would suggest a plan as a basis for a final and satisfactory settlement of the question. Its commencement might be more favorably made now than at any other time, as many of the finest depots and elevators now burned must be rebuilt soon.

Suppose all railroad companies agree, or by State and city legislation are required, to adopt a method for all to unite at an agreed point—say 15 miles out of the city, occupying for the purpose required one or more sections of land, as would be required for general yard rooms, freight and passenger depots. Here all freight and passenger businesses of all roads concentrate in approaching the city. From this place a system of straight lines, all in a body and side by side, sufficient for the necessities, runs directly to the heart of the city to some point accessible by all the requirements of business. Here would be located freight houses of sufficient capacity to accommodate the local in and out freight of all the roads. Adjacent would be a grand central passenger depot, where all passengers for any road or destination would assemble. Cars of all the various roads would here be concentrated, and passengers selecting the car for their desired route have no other trouble.

In entering the city, all would be done in the same manner.

The following reasons are given in support of this plan: Suppose ten different roads approach the city from ten different directions. There is a very large grain and other through freight product destined for Eastern markets which need never enter the city, and the country union yards would afford every facility for transferring. The same with passenger business: hundreds of passengers arrive to pass through Chicago every day. The change is made 15 miles out, without the trouble or expense of omnibuses or hack fare; there is less confusion and annoyance than the necessary changes for riding across the city in other vehicles would create—those for the city are carried directly to the cen-

tral depot in the city; persons leaving the city go directly to the central depot—never at a loss to know if they are right. Were this done, no doubt every street railway would arrange to reach this central depot, thus furnishing cheap, convenient and reliable transportation to and from it from all directions and within a few blocks at farthest from any desired point in the city. Freight for the country would be loaded at the central freight depot; all for the city would seek the same. Clustering around this depot would be the necessary system of elevators with railroad lines running to them. If compelled to do so all this business could be confined to a small space comparatively, and at the same time would add greatly to the convenience and facility of doing business.

Taking the ten different roads from as many directions, we find that the actual effect is, that for every road the property for one block is extent is more or less damaged—very much of it rendered worthless for any other purpose owing to the danger connected with it. Thus ten blocks in width and to the limits of the city, if not destroyed, are reduced at least 50 per cent. in value. Instead of this, have the ten roads enter the city all inside the space of one block, side by side, thus saving a space for business or residence purposes of at least a half mile wide and eight to ten miles in length. This is an item worth considering to a city like Chicago. These central depots could, probably, best reach the necessities of all business by being on the west side and near the converging of the two branches of the rivers. As the burned depots and elevators will have to be rebuilt, now would be the favorable time for this consummation. The various roads could vacate and sell their present tracks and property and relocate, all at a great advantage, owing to the large enhancement in value of lands, incident to their so vacating, and the new location made by a joint interest. This system of short lines between the country and city depots could be managed by a joint supervision, or be formed into a separate company, in either case guaranteeing all present and future roads equal privileges.

I submit this as a basis from which, I think, might be deduced a system which would meet all demands and at the same time avoid the damming of property all over the city, and also very largely diminish the danger to human life. ***

PRACTICAL FIELD ENGINEERING.

NO. II.

LOCATION OF CURVES.

The railroad curves of which we shall here speak are the arcs of circles, and are denominated 1 deg., 2 deg., 3 deg., 4 deg., etc., curves, according as the arc intercepted by a cord of 100 feet, is the measure of 1 deg., 2 deg., 3 deg. or 4 deg. at the center of the circle. Thus when we speak of a 1-deg. curve we mean that a chord of 100 feet intercepts an arc of 1 deg., etc.

The two straight lines which are to be connected by the curve are called tangents.

The point where these tangents meet is called the "point of intersection."

The point where a curve commences is called the "point of curve," P. C.

The point where the curve ends is called the "point of tangency," P. T.

A line drawn from a point in the arc to the center of the circle is called a radius, or the radius of the curve.

The angle lying between the prolongation of one tangent and the other tangent is called the angle of deflection, and is the measure of the degrees through which your curve must run. Thus if, in changing the bearing of your line of location, you deflect 10 deg. from a straight line, your curve, in order to join these two tangents, must run through 10 deg. For instance, where your angle of deflection is 10 deg. and you desire to join your tangents by a 1-deg. curve, since you have 10 deg. change to make in your bearing, and with every chord of 100 feet you use one degree, it is plain that ten chords of 100 feet each will exhaust your angle and establish your curve.

Now then, suppose you have commenced at the point of intersection and measured back to your point of curve, and wish to know the length of the radius of the proper curve beginning at this point, you have the following proportion:

Nat. tang. of $\frac{1}{2}$ the angle of deflection is to 1 as the distance measured on your straight line is to the radius of the required curve. That is, to find the length of the radius of the required curve, divide the distance in feet from point of intersection to point of curve by the natural tangent of $\frac{1}{2}$ the angle of deflection.

It must be borne in mind that all measurements must be horizontal and be made with the greatest care.

Now, having measured the length of your tangent from point of curve to point of intersection, and having calculated the length of the required radius, you have only to divide 5,730 feet (the radius of a 1-deg. curve) by the length of your radius in feet, and the result will be the degree of curvature.

You are now ready to run in your curve.

Having set up a vertical rod at the point of intersection, place your transit precisely over the point of curve and level it carefully. This done, make the 0 point of the vernier correspond with the 0 point of the horizontal limb, and here clamp the plates. Now turn the entire head of the instrument on its vertical axis until the vertical spider-line of the telescope coincides with the center of the rod, and here clamp the instrument, the line of collimation of which is now tangent to your proposed curve.

Now unclamp the horizontal limb of the transit, and turn the plate so as to carry the telescope forward in the direction of your curve until one half the degree of curvature is indicated on the graduated plate. Chain out 100 feet in this new direction, and at the end of the distance drive a stake. This fixes the first station of your curve. Turn forward again one half the degree of curvature and chain out 100 feet from this last point,

and at the end of the chain line in another stake, and so on to the end of your curve.

Some practical engineers prefer, where the entire length of the curve is visible from the point of curve, to "run in the curve toward them;" that is, setting the transit over the P. C., they sight to the point of tangency, and thence deflect and chain toward the instrument. This method is good for setting track centers on curves after the earthwork is completed.

If adjusted properly and used with care, the common railroad transit is the instrument with which to locate curves. After much experience I do not hesitate to say that the method I have just described is the best practical method of locating railroad curves, and there are very few cases where it cannot be used.

In my next paper I will discuss a number of methods for locating curves under such difficulties as now and then arise in the path of the field engineer to perplex him. A few practical directions, free from geometrical and trigonometrical puzzles, will be all that you will need.

HOOSIER.

Mathematics and Engineering.

BANGOR, Maine, August 8, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In a few late numbers of your valuable journal there have been occasionally communications from some of your contributors, giving us to understand the utter uselessness of mathematical education for engineers, and that the majority of the men now plying the profession of railroad engineer are not educated men, in the usually accepted sense of that term. Now will you allow me to ask what is the meaning of this? Are educated, professional engineers so few that their places have to be filled by what are termed "brought-up engineers;" or is it that the compensation for such services has become so low that educated engineers find better employment than roughing it, in railroad parlance, for \$100 per month; or has the educated engineer, with years of practice, become second to the "worked-up" engineer, with perhaps less years of professional experience; or, in fact, is an education in mathematics to be considered a drawback to the advancement of the young engineer? This ought to be known, if such is the fact. I have been led to believe that the technical part of an industrial pursuit can be learned; principles alone can be taught. It is only after having gone through a complete course of theoretical instruction in plain and abstruse mathematics, with all their absurd formulae (if it is fashionable now to so call them), that a young man with a mind well stored with solid scientific acquirements will, without difficulty or effort, I might say, master the technical part of his profession. A knowledge of the ruling principles make light and easy what would be the drudgery of the mechanical operation. Let us not sneer at the mathematician. It is true that, in years past, few American engineers, especially, have had the advantage of a liberal mathematical education; but it is a misfortune, nevertheless, and very much to be regretted. But, thanks to our technological schools, I am in hopes that class of what we may call men who "worked themselves up" to be engineers is getting scarce, and their places are filled with well-educated engineers.

The connection between science and art is like that between the thought and act of man; unless the science is always present within the act, directing it and giving it life, the art will be dead, and this fact is not the less true because some men, unacquainted with mathematical principles, have produced some of the best practice; the science guided their arm, although they knew it not.

Algebra and geometry are to the engineer what the modern machine tools are to the workman; by such aid work is done quicker, better, and by the exercise of a higher faculty. "While the uneducated man chalks out his work on the floor, and tries and fails and tries again to work some dimension required, the educated man figures out with his pencil in a single trial the information wanted, and knows that he is right." Thus says Liebig, the chemist, and the same remarks apply equally well to all technical pursuits. Knowledge of the ruling principles makes light and easy what would be laborious if only a mechanical operation. The hand which is connected with a thinking brain moves quicker and truer than that which depends on the head of another to direct it.

Science is not whatever loose ideas and unfounded opinion may be put forth as theory. There is too much of that article in print, which, going by the name of science, robs the true theory of its name. True theory can never vary, can never differ from the result of practice; if what is called theory seems to differ, the fault is in the figures, not in the theory. In fact, I am not very much troubled for the character of the educated American engineer. Many of them have designed and executed works of which any body of engineers might be proud, and we are not to confound these works with those of others, who, without either knowledge or skill, are allowed in these United States to set whatever trap they like in the great highways of the country. I knew, in this section, of one of those "brought-up" or "worked-up," as you may call it, engineers having charge of a new line of road, who, in opposition to the repeated demands of his bridge-builder, had his floor timber so light and so far distributed, and his track stringers so small, that after a few construction trains ran over his bridge, down went his engine into the river, killing four men on his construction train. If he had had but a little of those *useless formulae* in his head, he would have known that he had not material sufficient to sustain the weight required in ordinary railroad trains passing over his bridge.

I trust in a proper appreciation of the value of sound education, particularly in the education of a construction engineer, and hope that the public will know its value, and trust that you will bring the subject before your readers as often as circumstances will admit.

OLD ENGINEER.

Bangor Maine, August 8, 1872.

Easy Tests of Water for Locomotive Boilers.

CHICAGO, August 5, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It would appear from the statements made at the Convention of the Master Mechanics that no convenient method of precipitating the substances which go to the formation of the scale in boilers has yet been devised; and there are many places where the use of impure water cannot be avoided. But something may be gained, in many parts of this Western country even, by a choice of only the purest waters, if their comparative freedom from the most common salts is known.

Water taken from streams is always much less impregnated with these injurious substances than that procured from wells; and wells, separated by only very short distances, vary much in the quantity of these which they contain. It will, therefore, be of some service to make comparative tests, simply, of the water of the various streams and wells from which water must be taken, so as to instruct the men upon the locomotives where to take their fullest supplies, and what water to avoid, when possible.

An easy method of comparison is the following: Dissolve in a goblet of pure water (distilled, or freshly caught rain water) two or three teaspoonfuls of the oxalate of ammonia. Have equal quantities, say nearly a goblet full of each, of the waters to be tested, ranged side by side and marked so as to be identified. Into each of these goblets stir equal quantities of the solution mentioned—about three teaspoonfuls will be enough—and let them stand for a day. The lime and some other salts will be precipitated and fall to the bottom as a powder; and the quantity of this precipitate in each glass will form a very good index of its relative injuriousness in the formation of scale.

When the oxalate of ammonia cannot easily be procured, an experiment may be tried, in the same way, by dissolving common white soap, or other pure soap, in a goblet of pure water, and then stirring into the glasses of water to be tested a few teaspoonfuls of this solution. The comparative amount of lime in the water will be shown by the amount of coagulated matter which will be thrown down.

A little experience with these tests will enable any person to judge readily as to the hardness of any water which he may examine; while they may be much more easily applied than an exact analysis.

Yours faithfully,

ARCHIEDES S. WATT.

A Suggestion to "Hoosier."

TO THE EDITOR OF THE RAILROAD GAZETTE:

The purpose announced by "Hoosier," in the GAZETTE of August 3, is one which, if thoroughly effected, will be productive of so much good that any decided incompleteness in the arrangement of his subjects will be eminently worthy of much regret. With this conviction, I venture to suggest to "Hoosier" that he will increase, in no small degree, the value of his papers, if to the subjects already given he will add the following:

Setting out Trestles, Culverts and Bridges;

The Engineer's Field Work in Track-laying.

Not for myself, but on behalf of the army of young engineers now in the field, to whom I know that the proposed papers can be made very valuable, I respectfully solicit the attention of "Hoosier" to this suggestion.

J. J. D.

Rolling vs. Hammering Ingots.

[From a paper read before the American Institute of Mining Engineers at Philadelphia, by A. L. Holley, February, 1872.]

In order to put sufficient work on steel ingots for rails, they must be reduced from about 12 inches square. As this cannot be done at one heat, they are first drawn down to about 7 inches square, and then reheated and rolled into rails. This first reduction, or "blooming," is usually done in this country in a 30 inches 3 high rolling mill, with movable rolls, so as to get several reductions in each set of grooves. The first of these mills has been running at the Troy Steel Works above a year with great success. Another at the Cambria Iron Works has been running above six months, and has produced 140 tons of rail blooms from 12 inches ingots in 24 hours. The mill was not then fully employed, the limit of capacity being a single Siemens heating furnace.

The practice is now being introduced of rolling long 12 x 14 inches ingots, instead of the short 12 x 12 inches ingots, thus producing 3 rail blooms at one rolling, instead of two, and saving largely in labor and fuel. As the handling of the piece at the rolls, and indeed its charging and discharging at the furnaces, are performed by steam power, the large ingot requires no more men than the small one. The capacity of a blooming mill, rolling 3 rail ingots, may be safely put at 200 tons per day.

In England, and also at the Pennsylvania Steel Works at Harrisburg, the rail ingots are reduced to blooms by hammering, usually under 10 to 15 ton hammers. The 13 ton hammer at Harrisburg is a first-class tool, and the practice with it is unusually good. Its maximum production is about 75 tons of blooms per day, or much less than half that of a rolling mill which costs, with its engine, about the same money. A smaller number of men and less skilled and high-priced men are employed at the rolling mill. By the use of Mr. Fritz's feeding tables, the labor at the rolls is reduced to little more than directing the operation of the machinery.

Three-rail ingots cannot be advantageously handled under a hammer.

The impression has heretofore existed among railway men that the quality of what they call hammered rails is superior to that of rolled rails. The use of the rails has not developed this impression so far as can be ascertained. The impression is founded on the fact that iron is improved by hammering and that the highest priced steel—such as tool steel—is hammered rather than rolled.

It is true that the pressure of the hammer is greater and more concentrated than that of the light rolls usually employed, and that the hammer may expel more cinder, in the early stages of the iron manufacture. The real reason why the hammer is used in iron mills, however, is because it will work large and hard puddle balls and piles for which there is no adequate rolling machinery at hand. That rolls are preferred to hammers, even for iron, in the most improved practice, is shown by the

introduction of very heavy squeezers instead of hammers, for reducing the large puddle balls of the Danks furnace.

The hammer certainly increases the density of an iron or a steel bar, as compared with rolling. The rolls crowd the fibres back, as well as toward the center; the action of the hammer is exclusively toward the center. This is conspicuously shown in treating large ingots. The velocity of the hammer is greater than that of the periphery of the roll, hence the effect of its impact is greater on the surface of the ingot, while that of the rolls is more distributed throughout the thickness of the ingot. It would therefore be supposed that the hammer would draw the surface of the ingot so much as to leave concavities in its ends. The rolled bloom is cup ended, although it is more uniformly condensed than the hammered bloom. The result of this must be, and the fact is, that the rolled ingot is less dense; it weighs less per cubic inch, but at the same time is more uniform in structure. Now this density does not promote toughness in steel, whatever it may do in iron, while uniformity does promote toughness, and this is the quality to be most carefully looked after in the steel rail manufacture. Nearly all steel rails are hard enough for wearing purposes, and their hardness can be increased by chemical means, with the greatest uniformity and convenience—indeed the trouble is to sufficiently keep down phosphorus, silicon and other hardening agents.

It is stated that the carbon in hammered steel is chemically combined, while that in rolled steel is graphitic. If this is the fact in regard to rails, it is a strong argument in favor of rolling. As we have just observed, steel-makers, with the iron they have, find difficulty enough in making their rails mild and tough, without being subjected to the additional embarrassment of chemically combined carbon. It is well known that the tool-makers' process of hardening is simply combining the carbon while annealing—that safety process to which boiler plates and forgings are subjected to give them toughness consists in simply rendering this carbon graphitic—the same thing that rolling is said to do.

But, in fact, rail makers are not embarrassed by the hardening process imputed to hammering, because there is no such thing as a hammered rail, or as a structural condition of rail due to hammering. Whatever the condition of carbon in a hammered bloom, it is graphitic in a rolled rail. The reheating of the bloom, and its subsequent treatment by rolling alone, probably leave the physical condition of the steel substantially the same as if it had been rolled rather than hammered before reheating—excepting only the condition before mentioned, due to the character of the pressure—the rolled steel is less dense, and is more uniform. This uniformity is further increased by the fact that the temperature of a rolled ingot is practically the same at each pass, while the hammered ingot is reduced at varying temperatures.

A very large number of experiments have been made at Troy and Johnstown, on rolled and hammered ingots from the

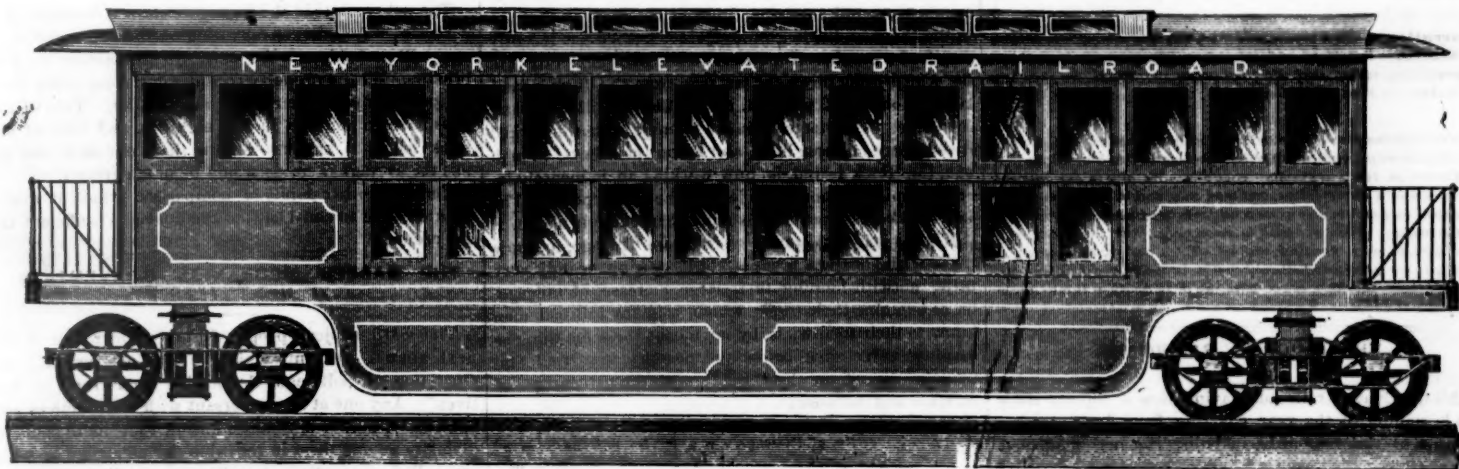
LOCOMOTIVE REPORTS, APRIL, 1872.

Master Mechanics of all American railroads are invited to send us their monthly reports for this table.

NAME OF ROAD.	Number of Locomotives in service.	MILEAGE.	No. of Miles Run to Ton of Coal.	COST PER MILE, IN CENTS.						AVERAGE COST OF	
				Passenger.	Freight.	Miscellaneous.	Total.	Coal.	Oil.	Coal.	Oil.
Burlington & Missouri River.....	60	44,309	79,841	36,000	160,228	57.44	45.00	14.78	3.64	0.33	0.72
Cleveland & Pittsburgh.....	76	77,981	201,929	85,125	181,859	60.60	48.51	3.13	4.22	0.76	1.95
Clev., Col., Cin. & Indianapolis.....	118	40,372	126,271	4,035	165,500	48.46	31.63	3.24	8.10	0.40	2.70
Chicago, Rk. Island & Pacific (Ill. Div.).....	99	115,179	136,732	37,543	234,429	41.71	14.31	3.49	6.77	0.58	2.75
Chicago, Burlington & Quincy.....	771.54	168	115,179	136,732	112,149	383,940	43.84	12.95	11.26	13.00	1.08
Eric Railway (Eastern Division).....	31	26,126	37,719	21,740	32,290	57.82	31.00	2.61	8.64	1.08	2.30
Illinois Central (Illinois Divisions).....	201.27	143	94,541	19,622	65,911	353,113	21.49	11.82	9.97	5.86	0.73
Kansas Pacific.....	401	34	27,501	1,676	12,611	91,463	37.34	19.32	8.28	6.93	0.54
Lake Shore & Mich. Non. (Buffalo Div.).....	88	65,460	79,950	67,411	212,037	44.17	15.26	6.40	9.23	0.50	4.00
Lake Shore & Mich. Non. (Erie Div.).....	99	23,970	114,510	30,004	196,110	47.40	16.80	4.20	7.30	0.40	17.70
Louisville & Nashville.....	78	31,675	139,746	45,877	215,392	44.00	41.00	16.00	6.32	7.00	1.44
Louisville & Nashville (Mt. So. Div.).....	161	30,771	129,482	27,470	197,055	44.17	46.65	12.97	5.27	8.62	1.69
Louisville & Nashville (Memphis & Ohio Div.).....	80	112,587	209,964	145,694	467,250	17.1	39.57	27.07	6.17	9.00	21.03
Leavenworth, Lawrence & Galveston.....	6	50,210	103,128	4,440	166,770	1.0	7.89	11.97	0.82	1.15	31.04
Pennsylvania (New York Division).....	17	17,498	17,846	6,176	40,823	63.04	35.50	2.96	4.61	0.55	7.61
Pennsylvania (Amherst Division).....	93	107,884	79,968	3,715	191,550	34.46	48.46	7.45	6.41	13.21	1.21
Pennsylvania (Middle Division).....	58	40,869	84,738	2,813	98,472	45.21	48.60	17.33	6.71	13.16	1.08
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	123	67,533	225,076	8,979	301,810	39.16	19.00	5.06	5.73	3.38	12.4
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	116	53,368	244,290	9,328	346,865	29.61	24.29	5.20	6.20	0.71	15.1
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	76	9,436	128,126	3,403	147,971	25.0	13.02	7.90	7.20	1.10	15.9
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	192	59,299	172,111	13,476	237,871	35.22	15.48	7.19	5.40	0.90	14.1
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	27	11,270	36,173	2,296	49,429	29.36	25.57	6.70	6.50	0.90	11.1
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	39	16,962	22,140	2,700	49,916	44.02	27.17	2.90	4.20	1.60	7.7
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	8	6,391	7,121	1,230	14,742	53.5	15.07	2.00	3.60	1.00	7.4
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	42	51,404	49,274	3,885	104,363	43.10	12.56	5.90	7.50	0.90	1.70
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	109.37	79,846	301,677	3,324	390,319	42.98	14.40	8.20	5.87	0.50	1.20
Pittsburgh, Cto. & St. Louis (L. Miami Div.).....	390	81,790	207,665	15,100	370,687	184.66	25.80	15.90	11.30	1.70	1.90
South Carolina.....	39	15,157	39,285	10,052	61,474	40.70	23.41	7.54	5.91	0.91	14.32
St. Louis, Kansas City & Northern.....	303.30	75	66,356	66,001	57,055	214,492	39.40	18.21	8.20	7.90	0.50
Denver Pacific & D'r & Boulder Valley.....	6,590	5,380	3,710	15,750	54.31	21.88	2.51	6.50	0.43	7.41	10.85

height and light. Thus, the gauge of the road being 4ft. 10in., the extreme width of the car is only 6ft. 10in., so that it overhangs only a foot on each side. The trucks are pivoted almost under the doors, and the body of the car is depressed be-

operated, and very few the extent of its operations. Heretofore it has had three stations: at Dey street, down town; at Watts street, near Canal, about a mile above; and at Twenty-ninth street, near the old Hudson River Railroad station, about three



the steel, and although the results confirm the above reasoning rather than contradict it, the difference in the quality of the rails is not very marked. In fact a large number of rails rolled direct from 9 inch ingots are wearing as well as far (three years) as rails made from either hammered or rolled 12 inch ingots. In making complete tests—tests to destruction—it is unnecessary to say that the size of the ingots experimented on by the hammer and the rolls should be the same. A test in which rolled 9 inch ingots are compared with hammered 12 inch ingots has no value.

The use of hammers or rolls for blooming seems to resolve itself, then, into a question of cost of product, as it has been impossible to establish, so far, any marked difference in quality—certainly none in favor of hammering.

We have shown that the rolling mill has over twice the capacity for a given cost, and that it employs less labor. Another advantage of the rolls is, that their collars hold up the corners of the bloom, thus reducing its cracking, and making sounder rails, as well as a larger number of first quality rails from a given number of ingots. Rolled blooms are of exactly uniform cross section, while hammered blooms must vary considerably. Hence the crop ends of the former may be reduced to a uniform minimum, while a large allowance must always be made in hammering.

Car for Elevated Railroad.

The accompanying engraving of a passenger car is from a drawing of one of four now running between the Battery and Thirtieth street on the New York Elevated Railroad. This railroad, by the way, is not the dead and buried work which many take it to be. In fact, though it can't be said to have done much business, we believe it has never ceased to be operated from the time when the endless wire-rope was given up and a locomotive put on the track for motive power. It could not do much, indeed, for its rolling stock consisted of a single engine and two or three street cars fitted with trucks. But the company into whose hands the property has fallen have been spending a little money on it, are prepared now to do a considerable business, and are making such arrangements as will enable them to do more. The first improvement was the putting of the track into condition and the purchase of new rolling stock, including an additional "dummy" engine and four passenger cars, such as are represented in the engravings.

The general construction of the vehicle is very well indicated by the elevation and end view. The aim of the designer seems to have been to make the car as stable as possible, with good

tween the trucks, so that the larger part of the load is actually lower than the bearing on the trucks, and the center of gravity consequently brought as near as possible to the rails. It is evident, therefore, that it would require a remarkable shock to over-



turn one of these cars. The wheels are 28in. in diameter. The extreme length of the car from end to end of the platforms is 35 feet; from door to door, 30ft. 6in. Height inside over trucks, about 6ft. 8in.; in body of car, 9ft. 6in. The seats are along the sides of the car, like those of a street car, and the interior is finished neatly, handsomely and comfortably. They seat 40 passengers each, and weigh 9,400 pounds, or 235 pounds per passenger, which advocates of the narrow gauge will please make a note of; also, that they are much more stable, and therefore capable of greater speed with safety, than any narrow-gauge cars heretofore described, and than any can be made without greater weight or smaller wheels. They were constructed by the Jackson & Sharp Company, of Wilmington, Del.

As we have said, few seem to know that this road is now

miles from Dey street. This week a fourth station was opened at Morris street, close to the Battery, about half a mile below the Dey street station. Next week it is intended to open a station at Twelfth street, and put in a switch there, which latter will make it possible to work the two trains to better advantage; and shortly a station is to be opened at Twenty-second street. The trip between Dey and Twenty-ninth streets—about three miles—is reported to be made regularly in fifteen minutes, which is about one-half of street-car time. The dummy engines used weigh 3½ tons, and burning anthracite coal, make little smoke and no sparks. They are not noisy, but the escaping steam is quite noticeable in the street under the track; but though almost constantly moving, and part of the time over streets crowded with vehicles, the animals seem to make little of it; though occasionally one is started by it.

Trains of late have been making twenty-eight round trips daily over the road. Morning and evening the cars are pretty well filled, and a large share of the passengers travel in them regularly. Quite a number of the commuters of the Yonkers trains of the Hudson River road make their way to Wall street by this line, which makes convenient connections for them. According to the time-table, the passenger leaving Yonkers at 7:15 in the morning is landed at Dey street at 8:10.

If the public takes kindly to the accommodations now offered by this road, it is the intention of its managers, we believe, to extend it northward toward the north end of the island and west of Central Park.

—A woman, an infant and a bottle of milk caused a great commotion on an Indiana train the other day, when it was running at the rate of forty miles an hour. The bottle dropped out of the window, the mother frantically pulled the bell-cord, stopped the train, and wanted the conductor to go back after the babe's lost sustenance. He didn't go.

—The employees of the Atchison & Nebraska Railroad have raised the sum of \$911.25 among themselves for the purpose of erecting a monument to the memory of their lamented Superintendent, Major F. R. Fitch at Boston. Three hundred and sixty-four men contributed to the amount in sums varying from \$1 to \$20.



Published Every Saturday.

A. N. KELLOGG & CO., Proprietors.

S. WRIGHT DUNNING AND M. N. FORNEY, Editors.

W. H. BOARDMAN, Acting Publisher.

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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the railroad public in affording us the material for a thorough and worthy railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—No charge is made for publishing descriptions of what we consider important and interesting improvements in railroad machinery, rolling stock, etc.; but when engravings are necessary the inventor must supply them.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, except in the ADVERTISING COLUMNS. We give in our editorial columns OUR OWN OPINIONS, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

THE CHICAGO RAILROADS.

All the Chicago railroads having issued reports since the beginning of the year, covering from five to twelve months of the year 1870, including the period affected by the Chicago fire, we may find it profitable to compare their operations, and ascertain the work of the lines as a whole—something we are not likely to consider when we deal with each separately. This study will perhaps be more valuable to Chicago and its merchants than to the railroad men, but is worth the attention of the latter, as by it they may obtain a broader view of the general field in which they work than otherwise.

In what we have to say, we consider only the lines from Chicago northward, westward and southward, excluding the lines to the east, which have a different office to perform and form a system by themselves. We therefore present side by side the results of the operations of Illinois Central, the Chicago & Alton, the Chicago, Burlington & Quincy, the Chicago, Rock Island & Pacific, and the Chicago & Northwestern roads, which are the only lines which bring considerable quantities of agricultural produce to the city, and carry lumber and merchandise from it. The Chicago, Danville & Vincennes properly belongs to this system; but as it has been open but a few months and has but lately fairly made itself known as a carrier—and especially as it has no previous year to compare with—it should not come into the comparison. The routes named bring to Chicago nearly all the grain and stock that finds a market in that city, with the exception of some millions of bushels, chiefly of corn, which arrive by canal.

In the first place, let us know the extent of the systems whose operations we chronicle. The aggregate length of the five roads—or system of roads, rather—was 4,297 miles in 1871-72, and 3,973 miles in 1870-71; the increase being 325 miles, or 8 per cent. The lines are in Illinois, Iowa, Wisconsin and Michigan exclusively, though, of course, they carry traffic from many other States. The reports of the Illinois Central and Chicago & Alton are for the calendar year; of the Chicago, Burlington & Quincy for the year ending with April; of the Chicago, Rock Island & Pacific for the year ending with March;

of the Chicago & Northwestern for the year ending with May.

The gross earnings of these roads for the two years last reported, with the percentages of increase and decrease, were as follows:

	Gross Earnings.		P. c. of Inc. or Dec.
	1871-2.	1870-1.	
Illinois Central.....	\$8,497,485	\$8,746,777	-2.85
Chicago & Alton.....	5,375,910	4,549,405	+18.85
Chicago, Burlington & Quincy.....	7,369,010	7,307,685	+1.5
Chicago, Rock Island & Pacific.....	5,900,797	6,028,287	-2.1
Chicago & Northwestern.....	11,402,161	11,694,914	-2.56
Total.....	\$38,646,363	\$38,537,668	+0.315

The increase of .315 per cent. is small, to be sure, but still it is an increase; but when we take into consideration the larger mileage (8 per cent.) worked, it has not so favorable an appearance. The only considerable increase is in the case of the Chicago & Alton, which has a large increase in mileage, and three of the five companies report a decrease.

A more accurate idea of the changes in traffic, and especially of the relative productiveness of the roads, can be had from the following table, which gives the mileage of each road for each year and the earnings per mile, with the percentages of increase and decrease:

	Mileage.		P. c. Inc.	Earnings per m.		P. c. of Inc. or Dec.
	1871-2.	1870-1.		1871-2.	1870-1.	
Illinois Central.....	1,109	1,109	0	\$7,692	\$7,887	-2.85
Chicago & Alton.....	556	466	+19.3	10,540	10,461	+0.8
Chicago, Burlington & Quincy.....	759	642	+18.5	9,969	11,327	-11.2
Chicago, Rock Island & Pacific.....	590	590	0	10,001	10,217	-2.16
Chicago & Northwestern.....	1,313	1,165	+13%	8,687	10,004	-13.17
Total.....	4,297	3,973	8	8,992	9,700	-7.3

Here we see that every company shows a decrease in earnings per mile, varying from 11 per cent. in the case of the Chicago, Burlington & Quincy (which has recently acquired a number of new branches, with moderate traffic, which bring down the average from the former very large amount) to 2 per cent. on the Chicago, Rock Island & Pacific. The increase in the average mileage worked is very large on three lines, and nil on the others; though one, the Rock Island, is now working an immensely increased mileage, not included in the last reports. The average decrease per mile is more than one-fourteenth.

Now as it is important, especially for Chicago, to know if the traffic of these roads is not increasing, or only very little, notwithstanding their large increase of mileage, let us examine their traffic, which, as many railroad men know to their sorrow, is by no means the same thing as earnings. We give below the passengers carried and tonnage moved on these roads, with the percentages of increase and decrease:

	No. of Passengers carried.		P. c. of Inc. or Dec.	No. of Tons hauled.		P. c. of Inc. or Dec.
	1871-2.	1870-1.		1871-2.	1870-1.	
Ill. Cen.....	1,296,584	1,276,585	-1.5	1,831,944	1,623,944	+12.8
Chic. & Al.....	715,162	732,531	-2.3	1,501,496	1,261,032	+19.4
C. B. & Q.....	1,459,804	1,365,577	+6.9	1,689,104	1,382,515	+22
C. R. I. & P.....	708,443	706,815	+0.05	1,014,347	914,345	+10.9
C. & N. W.....	2,324,705	2,239,494	0.67	2,510,016	2,290,170	+9.3
Total.....	6,364,898	6,423,002	-0.9	8,546,907	7,480,105	+14.2

This tells a different story. With an increase of 8 per cent. in mileage, we have, it is true, a decrease of nearly 1 per cent. in the number of passengers carried (the minor traffic), but an increase of 12½ per cent. in the tons of freight hauled. If we count a passenger as equivalent to a ton freight, as is customary, we have an increase of 7 per cent.—very nearly equal to the increase in mileage, which is exceedingly favorable, considering that the new lines naturally have less favorable locations (the best having been taken first) and can have only begun to develop a traffic.

The changes in passengers carried are not very great on any line, the Illinois Central losing about one-sixteenth and the Chicago, Burlington & Quincy gaining about one-twentieth.

It is evident therefore that the rates and the traffic are not quite uniform; and the following table will bring to light the discrepancies:

	Passenger Earnings.		P. c. of Inc. or Dec.	Freight Earnings.		P. c. of Inc. or Dec.
	1871-2.	1870-1.		1871-2.	1870-1.	
Ill. Cen.....	\$1,599,310	\$3,117,527	-10.3	\$6,066,713	\$6,142,521	-0.9
Chic. & Al.....	1,373,793	1,292,185	+6.3	3,740,203	3,319,068	+12.9
C. B. & Q.....	1,734,544	1,730,301	0.3	5,299,874	4,949,654	+7
C. R. I. & P.....	1,394,140	1,713,133	-18	4,313,373	4,063,273	+6.2
C. & N. W.....	3,960,651	3,338,111	+18.6	7,531,375	7,700,809	-2.2
Total.....	\$9,532,441	\$10,186,250	-6.4	\$36,961,437	\$36,128,354	+2.3

Here are notable fluctuations. With a decrease in the

number of passengers of less than 1 per cent., there is a decrease of 5½ per cent. in passenger receipts; and with an increase of 12½ per cent. in the amount of freight, there is an increase of less than 3 per cent. in the receipts for carrying it: that is, the roads receive less money for doing the same work.

The Illinois Central and Rock Island roads show very large decreases in passenger earnings, and the only increase is in the case of the Chicago, Burlington & Quincy; and that is less than ½ of 1 per cent. Competition seems to have affected passenger more than freight rates. Three of the five companies show an increase in freight receipts, and in the case of the Chicago & Alton it is large.

Now, having found an increase in traffic, a decrease in rates, and a very small increase in gross receipts, the proprietors of the railroads will have still other questions to ask, concerning them very closely. What have been the working expenses and net receipts? They are given below:

	Working Expenses.		P. c. of Inc. or Dec.	Net Earnings.		P. c. of Inc. or Dec.
	1871-2.	1870-1.		1871-2.	1870-1.	
Illinois Cen.....	\$5,668,234	\$5,841,616	-3.1	\$2,729,247	\$2,857,321	-4.5
Chicago & Al.....	3,080,825	2,786,051	+10.6	2,198,083	2,063,269	+6.5
C. B. & Q.....	4,949,833	4,425,674	+11.7	2,619,177	3,004,707	-12.8
C. R. I. & P.....	2,950,263	3,415,459	-13.3	3,171,535	2,623,826	+20.9
C. & N. W.....	6,810,026	6,311,506	+7.9	4,592,136	5,383,408	-14.7
Total.....	\$23,459,341	\$22,758,380	+3	\$13,313,780	\$13,931,564	-4.5

With an increase in traffic, and in three cases a large increase in mileage, we should look for an increase of expenses; and we have it. It is only 3 per cent., however, while the increase in mileage is 8, and in traffic 7 per cent. The roads with a large increase in mileage, all have an increase in expenses, but it is in every case less than the increase in mileage. The Rock Island has a very large decrease in expenses, which goes far toward keeping down the average of the total.

The net receipts in the aggregate show a decrease of 4 per cent., which, in consideration of the increased mileage, will probably not be entirely satisfactory to proprietors. With a property considerably more costly than the previous year, the returns are smaller. Two of the lines have an increase in net earnings, and that of the Rock Island is immense—more than one-fifth; but for this the average decrease would be much greater.

There are other points of comparison which it would be interesting to consider, but the above is sufficient for the present.

THE MASTER MECHANICS' CONVENTION—NEXT YEAR.

The sixth subject proposed for consideration at the next annual convention is "The Construction and Operation of Solid-end Connecting Rods for Locomotives." Any one at all conversant with the practices and opinions of master mechanics knows that there is much diversity among them in regard to the efficiency of what are called connecting, coupling or parallel rods made without a stub-end and with a single bushing, instead of two adjustable brasses. The arguments advanced in favor of the solid-end rods are, that they are simpler in construction, that their first cost is less than the others, that they are lighter, and that they are incapable of being altered in length or distance apart of the centers of their bearings, and cannot be keyed up so tight as to cut the brasses or bearings. On the other side, it is contended that the bushings soon wear, and cause the engine to "thump," and that with adjustable brasses and keys this lost motion can be taken up and the length of the rods adjusted to the distance apart of the centers of the axles, which is much more convenient than to be obliged to set the axles to conform to the rods. The chief objection to stub-ends seems to be that in careless hands their brasses are liable to be so adjusted as to make the distance apart either greater or less than that of the axles, and thus throw a great strain on the crank pins and other parts. It is maintained by some experienced persons that lost motion in the bearings of coupling rods is not objectionable, but rather advantageous, as it allows that much adjustability, or rather adaptability, of the length of the rods to the distance apart of the pins. The latter, within certain limits, varies considerably. It has been found, for example, that the distance between the centers of the axles is materially greater when an engine is fired up than when it is cold, the increase being due to the expansion of the frames caused by the heat communicated to them from the boiler. While this degree of warmth is almost uniform in all kinds of weather, it is obvious that the temperature, and consequently the length, of the rods varies considerably when the weather changes from warm to cold. There is also considerable variation in the distance apart of the centers of the axles, due to the rise and fall of the axle-boxes in the jaws if their movement is not simultaneous. If, therefore, the ends of the rods are keyed tight to the crank pins, they must be subjected to great strains by these variations in length. If,

however, there is more or less "lost motion" in the bearings, it will allow the rods to adapt themselves to the difference between the length of the rods and the distance between the centers of the axles. In this connection, some data regarding the relative first cost and expense of maintaining the two kinds of rods would, of course, be valuable and instructive.

The seventh subject—"Resistance of Trains on Straight and Curved Tracks, on Wide and Narrow-gauge Roads, with Four or Six-wheeled Trucks, and with Long and Short Wheel-Base"—we have frequently referred to in the columns of the *GAZETTE*. There is at present no accessible record of experiments which are conclusive or satisfactory, or which determine accurately the resistance of American rolling stock or the effect of the varying conditions named above. An able theoretical investigation of the subject would be valuable; but some carefully conducted experiments are what is most needed to demonstrate the theoretical conclusions, and determine definitely and certainly the actual resistance of our American rolling stock.

The eighth subject—"The Efficiency of Check or Safety Chains on Engine, Tender and Car Trucks in Lessening the Danger Resulting from Running off the Track"—is one regarding which there is a great diversity of opinion. It is quite certain that the trucks of a car will run a considerable distance if they are prevented from turning across the track. As soon as they get into the latter position they become an obstruction which is almost certain to crush through the bottoms of the cars or else throw them laterally from the track. If these check-chains will hold the trucks parallel to the track after they leave the rails, the train can usually be stopped before any serious injury is done. Those who do not believe that check-chains are effective in such cases to prevent the evil referred to say that, in the first place, a chain will not hold a truck when a car runs off the track; which doubtless is true if the chain is not strong enough. To say that a chain cannot be made strong enough is absurd. It is said, however, that if the chains are made of the required strength, in case of accident they will tear out the sills of the cars and thus do more mischief than good. We have never heard of an authentic case of this kind, but know of a number where the train and passengers were saved from destruction by the chains. That many of the chains and their attachments which are now in use would be of very little more service than so much tow yarn is very obvious on examination. The chains themselves are often entirely too light, and often when made heavier their attachments are so weak that a very slight strain will tear them loose. It would be very interesting, and much information could be elicited, if the testimony of leading railroad managers in every department could be had regarding the points we have indicated. Superintendents, traffic-managers, road-masters and conductors could give, perhaps, more information regarding the practical operation of check-chains than master mechanics; and as there is nothing in the constitution or practice of the Master Mechanics' Association to prevent the Committee from procuring testimony referring to any of the subjects for consideration from any source, we venture to suggest that it would do much to determine the "efficiency" of check-chains, if they could get from the persons referred to a description of accidents in which, in the opinion of the witness, destruction of life, limb or property was or would have been prevented or caused by the use of check-chains in the trucks of cars, and the reasons for such opinion. The size and number of the chains, the nature of their attachments, and the point of fracture or failure in case there was one, should be given as nearly as possible.

The Committee on "The Machinery for Removing Snow from the Track" have a subject which only those who have done that kind of work would know how to treat. The practical object aimed at in the appointment of a Committee is, to learn what is the best and most efficient machinery now known for the purpose. This is very hard to determine, because so few persons have opportunities of comparing the operation of different kinds of snow plows, as they are used only a few times each year, and on occasions when it is difficult to make a journey—even if a person were so disposed—to see them at work. While it is important for immediate purposes to know which is the best machinery for removing snow, with this subject as with nearly all others, it is important also to know the general principles which must be observed in order to do the work to the best advantage. These we have never seen or heard discussed. Every master mechanic knows the visionary inventive kind of man, who devises snow-plows which work with wheels and screws, and all sorts of possible and impossible contrivances, and who does no one any good excepting patent agents. We doubt whether it will be worth while to give much time to investigation in their particular field.

The tenth subject—"The Machinery and Appliances

for Supplying Fuel and Water to Locomotives"—is becoming more important as the traffic and the speed on railroads increase. While there are only a few engines to be supplied with fuel and water, and no special haste is necessary in doing it, there is little difficulty in devising the requisite means; but when hundreds of engines and tenders must be filled each day, and when every minute that can be saved is precious, it becomes quite a different problem. There is room for a treatise on the subject, and obviously plenty of material for a report of almost any length.

"The Machinery and Appliances for Removing Wrecks and Erecting Bridges" is also an important subject, and one which is becoming more so as the business of our long lines becomes developed.

The twelfth and last of the new subjects proposed for consideration next year is "The Best Form and Proportion of Axles for Cars and Locomotives, also Whether there is Anything to be Gained by the Use of Compound Axles and Loose Wheels." If the Committee can succeed in setting at rest the exaggerated ideas regarding the amount of saving which would result from the use of wheels which can roll independently of each other, they will at least do a great negative good, and possibly rid railroad shops of some of the troublesome inventors of such devices, and save the companies some money which is now occasionally expended in this direction.

With reference to "The Best Form and Proportions of Axles," the nature of the work the Committee have before them might be most clearly stated when we say that at the present time the best form is not known, and therefore they have an opportunity, if not for discovery, at least for formulating the principles involved.

As we have taken occasion to say before, the life of the Association is dependent upon the work of the committees and the co-operation and assistance of the members. Just in proportion to their fidelity to their work, will be the interest aroused by the annual conventions. If they neglect their duties or do their work carelessly, the proceedings will be sure to become flat, stale and unprofitable, and the members indifferent.

There was one tendency observable at the last and all previous meetings, in some of the reports, which cannot be commended. This is the preparation of reports which are merely a summary of the answers given to the committee's questions. While it is true that some of the subjects discussed at the meetings have only a sort of statistical character—that is, the questions involved are determined simply by practice and experience—yet in most of them it is not only the solution which is undetermined, but some of the elements, so to speak, of the problems are unknown quantities. A mere compilation or summing up of the opinions of others will, therefore, seldom shed much light on what is unknown.

San Francisco.

San Francisco seems not to relax its efforts to secure a new and independent line across the mountains to the Mississippi valley. Large individual subscriptions have been made to the company which purposes to co-operate with the Atlantic & Pacific, and it is reported that the city is likely to subscribe as much as the law will allow (about ten millions) to the stock of the same company. The situation of San Francisco is peculiar, in that it is dependent on one corporation (or rather on one combination of capitalists; for they form several corporations) for all its railroad connections; and the fear is expressed that these men will use all their power to favor the diversion of trade to the east side of San Francisco Bay, and the creation of a new city there to take the place of San Francisco.

If the people of this (and of other large cities which are fearful of annihilation by some railroad, new or old) will only consider a little the relative value of railroads and cities as instruments in trade, they will probably be somewhat calmed. The capital account of the Central Pacific Company (which is probably equal to two or three times the actual cost of the property) is put down at about \$125,000,000. The other corporations may bring up this amount to \$160,000,000. Now, the true valuation of the real and personal property of San Francisco County in 1870 is given by the census report as \$263,000,000. Nearly all of this value is in the city, and virtually all of it, we may say, has a part to play in the service which San Francisco was made to render to the Pacific coast and to the country. Probably the city has a value fully four times as great as that of the entire railroad system, and though not all of that amount would need to be invested to make an equal city on new ground, a very large amount would be necessary. Stores, warehouses, banks, residences—indeed, almost every industry and occupation, including amusements, etc. (since people will have them), are just as necessary instruments of trade as railroads and steamboats, and they usually cost much more and are of very

much slower growth. While San Francisco cannot do without railroads, neither can the railroads do without San Francisco.

Another thing should be pondered by the indignant San Franciscans, and that is that it needs connections with the interior of the Pacific slope much more than it needs a new route to the East. It has always the free ocean as a highway to the rest of the world; the Northern Pacific is coming and the Texas & Pacific will not be far behind. But it is with San Francisco as with nearly all other cities—its most important and intimate relations are and will long continue to be with the country near by, and not with that far off. It may be accepted as an axiom in transportation (liable, to be sure, to modifications) that the traffic of a city with other places will be inversely as their distances from it; and sometimes we may say inversely as the squares of those distances. We sometimes have to eliminate wholly distances by sea from such calculations; very rarely inland distances. Half a dozen short lines and the lowest practicable rates between San Francisco and New York will not tell in the prosperity of the great Pacific port a tithe as much as a complete system of railroads giving it easy access to all the cultivable area west of the Sierras, and as many steamer lines as can find traffic.

The value of the Atlantic & Pacific to the city, we venture to say, will depend very much on the extent of new country in California which it shall connect with San Francisco. If the people of San Francisco succeed only in completing their end of the road, they may be rewarded for all their trouble and expense, provided that it is well located to secure local traffic, and especially the traffic of districts now undeveloped.

The Rockford, Rock Island & St. Louis.

Mr. Wolff, the agent of the German bondholders, has returned from America to Frankfurt, bringing with him this company's proposition for a settlement with its bondholders, which is substantially as follows:

From and after the 1st of February, 1873, the coupons to be paid in cash to the amount of one-half of their face.

Every bond to be stamped with the notice that thereafter it represents but one-half of its nominal value.

For the other half of every bond, preferred stock to be issued, on which dividends will be paid in proportion to the amount of net earnings, all of which (after paying the interest on the bonds) must be devoted to dividends on the preferred stock until these dividends amount to 7 per cent. Should the earnings be sufficient to pay more than 7 per cent. on the entire stock, common as well as preferred, the dividends will be the same on both classes of stock.

Coupons Nos. 6, 7 and 8 (back-due) to be converted into 4 per cent. gold interest-bearing certificates of indebtedness (interest beginning August 1, 1873), which are to be paid out of the net earnings of the road.

The stamping and converting of the bonds, and future payments of interest, to be made both in New York and Frankfurt.

The above proposition, which we find in the *German American Economist*, had not been passed upon by the committee of the bondholders at the time of publication, but has probably by this time been recommended or otherwise to the bondholders. Its great fault, it seems to us, is the large demands it will make on net earnings, especially when we consider that the net earnings have been nil. We believe that all that is necessary to put the bondholders in possession of the entire property is a suit for foreclosure, which probably would not be resisted. Very naturally and very justly a company of Germans residing four thousand miles away distrust their ability to manage successfully such a property; but they at least would have a motive for managing the property skillfully and economically which, as matters now are, or as they are likely to be if this proposition is accepted, can hardly affect the present nominal proprietors. That is, they will probably get some income from the road, and that income will be just in proportion to the skill and economy of the management. Now the stockholders cannot expect any income from the property; if they increase its earnings largely and reduce its expenses, no part of the consequent savings goes into their pockets, but all that can be expected for many years, or forever—so far as we can now see—into the hands of their creditors. Under such circumstances those who may chance to control the management are more likely to be profited by a loose and lavish management than by an economical administration. It is always unfortunate for a railroad to be so situated, and it is always desirable that it be got out of such a situation whenever practicable.

The capital stock of the Rockford, Rock Island & St. Louis Railroad Company stands now at \$9,000,000, and the bonded debt is an equal amount. Therefore, if the company's proposition is accepted, the common stock will be a majority of two-thirds, and those who own it, and whose chances for any income on it are exceedingly remote, will still choose the directors and dictate the management of the road.

The Value of Mathematics to Engineers.

A correspondent in another column protests against some statements by other correspondents which seem to deny the value of mathematics to practical engineers. We certainly need not say that we do not sympathize with any expressions decrying the value of mathematics to engineers. We believe

it is impossible for the engineer to have too much mathematics, and that he who has no mathematics, or only a smattering of its elements, scarcely deserves to be called an engineer, however skillful he may be in some kinds of engineering work. A man may become very familiar with the transit or level, or both, and very skillful in the use of those important engineering instruments, with little more mathematical education than a knowledge of the fundamental rules of arithmetic, and such a man may do very valuable work in an engineering party; but he is not properly an engineer. Many men can do very good work in construction—the best work, perhaps—if they have a structure to copy exactly, or designs to work from, though they may have very little education of any kind, mathematical or other; but to instruct such men with the *designing* of work might be criminal.

So far as our correspondents are concerned, while we disclaim any responsibility for their opinions, we think what has been said was intended to give emphasis to the fact that much information which is not mathematical is needed; in short, that an engineering education is not *all* mathematics, that mathematics is sometimes out of place, and that some kinds of engineering work can be (and are) done by men who have very little mathematics, and who want information in a form intelligible to them.

As to the general question of the education of engineers, we will have little to say of that now: only it may be well to bear in mind that the prejudice, so far as it exists, against "educated engineers," is due largely to the fact that quite commonly a sharp line is drawn between the graduates of technical schools and other engineers, and the former alone are classed as "educated." Now that instruction which can be got from books alone can be and often is acquired by men who have never seen a technical school, and it should be clearly understood (but frequently is not) that he is an educated man who has acquired knowledge and received training, wherever and however acquired and received. If the engineer has attained a thorough knowledge of trigonometry, analytics, calculus, statics, dynamics, etc., in Freiberg, Troy, West Point, New Haven or Boston, well and good; and if he has acquired it partly in a country school and partly at home after working hours, also well and good. When he offers his services in the profession, the question should be, Has he the necessary knowledge, training and skill? not how he got them.

Railroad Construction in Costa Rica.

The Spanish American States are for the most part very poorly provided with railroads, and we sometimes deride their want of enterprise in that direction, and cast our 60,000 miles of road in their faces, so to speak, as proof of our superior enterprise, energy, etc. But there are two (or more) sides to this question, as to most others. To say nothing of the lack of traffic, which is generally abundant excuse for the want of a railroad, in many of these states there are extraordinary obstacles to construction. We know how it is in Peru, where railroads have to ascend the Andes at a single leap, as it were; and we have recently had some account of the exceedingly difficult and costly work now in progress on the Mexican Railway. There are equal difficulties in Central America, as will appear by the following translation from *El Ferro Carril*, of San Jose de Costa Rica, dated June 15, 1872:

In the first days of last May, a costly expedition was inaugurated to search for the location of a new railroad line between El Limon and La Angostura, passing through Tuis and Chirripo, under the immediate orders of Senor Don Alfred F. Sears, a most able engineer who has figured prominently in some of the most important railroads of the United States.

This expedition was accompanied by Don Jesus Bonilla, who suggested the expedition, and by Don Jose Maria Figueroa, and other influential persons of Cartago.

The only result obtained has been the loss of three men in the mountains, and the full conviction that—at present, at least—a railroad is absolutely impracticable between Limon and Angostura, passing through the valley of Tuis and Chirripo.

One of the bridges of this line would need to be three miles long and 3,000 feet high—costing \$20,000,000.

"Senor Don Alfred F. Sears" our readers will remember as the author of a very good paper on economy in railroad construction, read before the American Society of Civil Engineers and partly reprinted in the *RAILROAD GAZETTE* a few months ago. His specialty being cheap construction, this line must have been a shocking one.

Record of Track Increase.

In this number of the *RAILROAD GAZETTE*, under the head of "Old and New Roads," information is given of the following additions to the track mileage of the country: *Chicago, Duquesne & Minnesota*, Lansing northward to Albin, Iowa, 11 miles. *Little Rock, Pine Bluff & New Orleans*, extended northward 18 miles from its last year's terminus 18 miles north of Chicot City to a point near Dixon Bayou, Ark. *Davenport & St. Paul*, extended from Monticello northward to Hopkinton, Iowa, 10 miles. *Cincinnati & Terre Haute*, formally opened for traffic August 6, from Terre Haute southeast to Middlebury, Clay County, Ind., 30 miles. *Rio Grande Railroad*, 6 miles of track laid on this line from Brazos Santiago to Brownsville, Texas. *Utah Northern* (narrow-gauge), track laid from its junction with the Central Pacific, near Corinne, northward 22 miles. *Utah Southern*, extended southward 8 miles to Point Mountain, 25 miles from Salt Lake City. *Buffalo, New York & Philadelphia*, from Olean, N. Y., southward to the Pennsylvania line, about 10 miles. *Detroit & Bay City*, from Detroit northward to Utica, Mich., about 20 miles.

The above include 135 miles of road.

Errata.

In an article by Prof. C. A. Smith, published August 3, under the head of "Eastern Engineering," from a Western Point of View" (page 339), two errors in figures were made in printing.

The diagonals are of 14-in. round iron, and not the mere wires which the description "4-in. round iron" would make them; and 62.5 tons is the strength of the main ties, not "52.5 tons," as was printed.

"SUBSCRIBER," of Freeport, Ill., who writes to us requesting a list of all the railroad superintendents in the country, will find those of roads in operation in the *Official Railway Guide* more fully than elsewhere. We give all the appointments on new and old roads as completely as we can, and give addresses whenever we can find them.

Train Accidents in July.

On the afternoon of the 1st the mail train on the New York & Oswego Midland Railroad ran off the track at Unionville, N. Y., and went entirely through a small milk station, injuring eight persons, but none fatally.

On the afternoon of the 2d, on the Iowa Division of the Chicago & Northwestern Railway near Belle Plaine, a freight train ran into the rear of a construction train, telescoping the caboose of the latter, and killing one man and mortally wounding six others, nearly all of whom were scalded to death. The following report of circumstances is made: "The construction train had orders to work between Belle Plaine and Luzerne, the first station this side. Freight train No. 17 arrived at the latter station at 9:10 in the morning, and telegraphed to Belle Plaine for an engine to help them over the Buckeye grade. The engine was sent and ran into the construction train, which was backing up to get out of the way of the freight train."

On the 2d, one of the middle cars of a freight train on the Kansas Pacific Railway got off the track and was dragged three miles over the ties before it was detected. It finally broke loose and ran out upon the prairie. It is reported that 2,000 ties were so damaged that it was necessary to remove them.

On the morning of the 3d a milk train of the New Jersey Midland Railroad ran off the track at Washington street, Jersey City, causing considerable damage.

Early in the morning of the 4th, as a passenger train on the Boston & Albany Railroad was moving eastward, near the High Bridge, two miles west of Chatham, N. Y., the locomotive was thrown from the track by a misplaced switch, and went down a bank twelve feet high, scalding the engineman severely. The cars did not leave the track.

On the 4th an east-bound passenger train on the South Side Railroad of Long Island ran into a west-bound passenger train which was standing on the track at Hibbard's Station. A flag had been sent forward to stop the east-bound train, but brakes were not put on in time to avoid a collision, though speed was slackened considerably. Two cars of the standing and three of the moving train were forced together, and eight persons who were on the platforms or jumping from them were injured, three of them fatally.

An examination by the Superintendent and a coroner's inquest leaves no doubt that the conductor and engineman of the east-bound train were running on the time of the opposite train. Their train was behind time at Bushwick, the next station west. They left it at 5:12, knowing the west-bound train was due at Hibbard's at 5:13, and was to leave at 5:17, and that, allowing the four minutes prescribed by the rules for difference in watches, they could not possibly make it in that time. The rule is that "westward-bound trains, on reaching Hibbard's Station, and not having passed eastward-bound trains on double track (as called for by time-table), shall proceed after having waited four minutes (this time being allowed for variation of watches), and such eastward-bound trains must not leave Bushwick until such westward-bound trains have arrived, or are 24 minutes late."

On the 4th a west-bound passenger train on the Southern Pacific Railroad ran into a drove of cattle four miles west of Shreveport, La., throwing the engine and tender off the track and killing four persons.

On the morning of the 6th an east-bound freight train on the Peoria & Rock Island Railroad ran into a cow about five miles from Rock Island, throwing the engine and four cars from the track, and severely scalding the engineman and fireman, the former perhaps fatally.

On the 6th a train on the Fairhaven Branch Railroad, consisting of a new locomotive, 31 empty coal cars and two passenger cars, ran into a herd of cows near the highway bridge three-quarters of a mile north of Mattapoisett, Mass., killing four of them and throwing the engine, tender and 27 flat cars off the track, piling them up in confusion and tearing many of them to pieces. The tender was thrown clear over the engine, and then the engine on top of the tender. The demolished cars were piled up twenty feet high. The engineman and fireman were found dead under the engine.

On the 7th, near midnight, two freight trains on the New York Central & Hudson River Railroad came into collision near the east end of the new bridge at Albany, the safety signal having been displayed until after the east-bound train had crossed the draw, while a west-bound train was standing on the approach or had just entered the bridge. The east-bound train was going at considerable speed, but was reversed a very short distance in front of the opposing train. In the former train the first car was lifted from its track and thrown on top of the engine (without injuring a span of horses inside of the car), the second car was broken to pieces, and much damage was done to the other cars. The conductor had a leg terribly crushed.

On the 8th a peculiar accident occurred at Cedar Rapids, Iowa, on the Chicago & Northwestern Railway, which a correspondent of the *Dubuque Herald* describes as follows:

"While the switch engine in the depot yard was standing on the track, with steam up, and the fireman and engineer both absent, it took a sudden notion to start off on a spree, and started backward at full speed, driving half way through a passenger coach, which chanced to be standing in its way, making a total wreck of things generally. It took a number of hours to clear away the wreck occasioned by the accident."

On the morning of the 11th, as a construction train of five flat cars, loaded with ties, having on board about fifteen employees, was passing over a temporary bridge across the Green Brier River, about 14 miles west of White Sulphur Springs, W. Va., on the Chesapeake & Ohio Railroad, the structure gave way under it. The engineer and six others were killed, and eight were injured—no one on the train escaping.

The bridge is of four spans, each 120 feet long, the height to the track being 45 feet, under contract to be constructed of iron by Clarke, Reeves & Co. In order not to delay tracklaying, a temporary trestle bridge was constructed, as described by Mr. Clarke in the *GAZETTE* of August 10. It consists of two tiers of bents, the lower framed upon a mudsill, and with four longitudinal girts pinned to them and extending from pier to pier. The bents were well braced transversely, but there were no diagonal braces in the direction of the track. The bridge carried safely several trains of iron; but the bents where the water was deepest having settled, instead of driving the mudsill down to a solid bearing, it was blocked up from below, so that the blocking really formed the foundation of these bents. Not a stick of timber was broken, and it was immediately re-erected and has carried heavy trains safely since.

On the morning of the 12th a freight train (which should have been on a siding ten minutes before) and a passenger train on the Pittsburgh, Cincinnati & St. Louis Railway met in collision at Bowerstown, Ohio. Nine passengers, a brakeman and the baggage-man were injured—one severely. The baggage car telescoped the smoking car, and pushed it under the passenger car, tumbling the train off the track.

On the 13th an engine on the Princeton Branch of the New Jersey Railroad was thrown from the track by a misplaced switch, and the engineman was severely injured.

On the morning of the 14th a through train on the New Jersey Division of the Pennsylvania Railroad ran into a cow near Doylestown, Pa. The locomotive was thrown from the track, rolled down an embankment fifteen feet high and exploded, fatally scalding the engineman.

On the morning of the 14th a south-bound passenger train on the Selma, Rome & Dalton Railroad broke through a culvert two miles north of Columbiana, Ala., wrecking the baggage car and second-class passenger car, the engine not being injured. Two persons were injured somewhat.

On the 15th, as an accommodation train was running as usual on the Chicago & Southwestern Division of the Chicago, Rock Island & Pacific Railroad, when two miles east of Gallatin, Mo., an axle under the second car broke, and that and the two following cars ran off the track. The fourth car was loaded with kegs of powder, and the trucks of the forward cars were jammed under it, broke through the car floor, and into some of the kegs of powder. Sparks from the broken trucks dragging on the rails exploded this powder, blowing off the tops of the cars, but doing scarcely any other damage, and not even exploding all the powder, 250 out of 700 kegs remaining. There were seven freight cars and one passenger car in the train. The *Leavenworth Times* in describing this accident says:

"The explosion did not consist of one thundering report, but a quick succession of thundering reports. The noise lasted about thirty seconds, and in this length of time 450 kegs of powder exploded. Streams of fire shot upward to a distance of fifty feet, followed by great volumes of dense smoke."

"The most fortunate circumstance connected with the accident was that no one was hurt, although the upper part of the car was blown to atoms. About two minutes before the explosion occurred two brakemen walked over the car containing the powder, and at the time the powder ignited were only distant three cars. The passenger car at the rear of the train was well filled with passengers, yet none were injured."

On the 19th, at 10:30 a. m., an east-bound passenger train, known as the "Baltimore passenger," on the New York & Hudson River Railroad came into collision with a west-bound coal train about three-quarters of a mile east of Pittsford, N. Y., and nine miles east of Rochester. The trains were hidden from each other until they were less than 100 feet apart. Engines were reversed and brakes put on, but of course with very little effect. The crash was tremendous; the freight engine ran over the passenger engine; the baggage car was telescoped with the smoking car; and the day passenger and Pullman cars behind were not injured. The engineman and fireman of the coal train engine saved themselves by jumping; the engineman of the passenger train who jumped received a few cuts and a sprained ankle, and his fireman, who remained on the engine, had a wrist broken. Nearly every person in the smoking car was injured, four mortally and eleven less severely.

It is reported that the coal train was running on the passenger train's time, and should have stopped at the next station east. There was no means of knowing it was there, however, that station having no telegraph office. The coal train was to have met the passenger at Pittsford.

The coroner's jury, after investigation, rendered a verdict, in which is the following:

"Although the blame for the accident rests heavily upon the conductor of the coal train, we think it rests hardly less so upon the management of the company for not requiring strict conformity to their rules, or specifying definitely under what circumstances and to what extent they may be varied from; and for not having a telegraph office at every station, with operators whose attention shall not be distracted from their business by other duties; and for overcrowding their single track with the coal trains between Canandaigua and Rochester, which greatly increases the danger to human life, the more particularly as the cars, many of them, are provided only with imperfect or useless brakes, and not well manned with brakemen."

On the 20th the engine and two cars of a freight train on the Indianapolis, Bloomington & Western Railway were thrown from the track and badly broken up, two miles east of Covington, Ind. No one was much hurt, but the road was blocked about three hours.

On the 23d an engine on the Peninsular Railroad was thrown from the track by an ox near Charlotte, Mich., and the engineman was killed.

A little after midnight on the 23d, during a heavy storm passenger train No. 5 on the Hannibal & St. Joseph Railroad, while running between Hannawell and Salt River, ran into some

troes which had blown across the track. The shock was very sudden, and the engine was partly turned over, the tender reversed, the baggage car across the track, the second-class car turned on its side, and the first-class car following thrown from the track. The second-class car was full of passengers, one of whom was badly cut with glass, and another had a shoulder badly hurt, but the rest were very little hurt. The engineman and fireman saved themselves by jumping. Superintendents Nettleton and Towne, both of whom were on board, give it as their opinion that some of the cars must have been telescoped but for their Miller platforms.

On the 25th a rail broke under a coal train on the Pittsburgh & Connellsville Railroad about two miles west of West Newton, Pa. The locomotive passed over safely, but the seventeen cars of coal in the train were tumbled all over the track. No one was hurt.

On the 25th a passenger train on the Des Moines Valley Railroad ran into a herd of cows a mile east of Comstock's Station, Iowa, by which most of the train was thrown from the track, and the engine, tender and baggage car were completely wrecked. The engineman and fireman were considerably hurt, but no passengers.

On the 27th, about noon, a passenger train on the Salem & Lowell Railroad, ran into some freight cars which parties receiving freight had run down a side track until they obstructed the main track. The cab was broken from the engine and the end of the baggage car broken in, but no one was hurt.

On the night of the 27th an east-bound passenger train on the New York Central & Hudson River Railroad ran into the rear of a coal train on the Southern Central Railroad at the crossing about a mile east of Auburn. The passenger engine was turned partly around, the baggage car knocked from its track and partly overturned, and the baggage man and a brakeman slightly injured. The coal train is said to have been in fault, having failed to make the signal required.

On the night of the 29th a box car containing mail and express freight of a north-bound passenger train on the Houston & Texas Central Railroad jumped the track and was broken up seven miles north of Ennis, Texas. No one was hurt.

On the morning of the 29th, about one o'clock, a west-bound passenger train on the Kansas Pacific Railway broke through the bridge over Coon Creek, 113 miles from Denver, Col. There were two sleeping cars, one first-class, one second-class, and a baggage and express car, all of which, except the sleeping cars, were wrecked. Five passengers were killed and three passengers and three train-men injured. The foundations of the bridge are said to have been washed away by a torrent or "water spout."

On the night of the 30th a switch locomotive backing some loaded freight cars to the depot of the Richmond & Danville Railroad, in Richmond, pushed them into a cow, which threw two cars off the track and killed a train-man who was standing on one of them.

On the 30th a collision occurred between a coal and gravel train on the Morris & Essex Railroad, near Drakesville, N. J. The gravel-train was standing upon the track, and through some mistake in signals was struck by the coal-train. A number of the cars of the latter train were demolished, and a brakeman seriously injured.

On the 30th, about 3 p. m., a few miles south of Alexandria, Mo., on the Mississippi Valley & Western Railway, a loaded box-car of a south-bound mixed train left the track at a low joint, tumbled down the bank, and dragged the baggage-car across the track, delaying the train six hours, but injuring no one.

On the morning of the 30th, as a north-bound passenger train on the Illinois Central Railroad was entering Freeport, Ill., on a down grade, the engine struck a cow and threw her up into the air. She fell on the track and the engine passed over her safely, but the tender, baggage and express car and two passenger cars were thrown from the track and had their trucks broken up. The express messenger was slightly hurt.

On the 31st a stock train going northward on the Jacksonville Division of the Chicago & Alton Railroad ran into a train on the Jacksonville Northwestern & Southeastern Railroad, at the crossing in Jacksonville, Ill., breaking up three cars and injuring the locomotive. A report says that the stock train failed to come to a full stop before crossing, as the laws of the State and rules of the road regulate. There is a steep down grade at the crossing. The damage is estimated at \$3,000. No one was hurt.

Thus the number of accidents enumerated above is 31, nine of which were unaccompanied by death or bodily injury. The other 22 occasioned the death of 35 and the injury of 66 persons.

The accidents may be classified, as to their causes, as follows:

Deraillments—	
By cattle on track.....	8
Imperfect joint.....	1
Misplaced switch.....	2
Fallen trees.....	1
Unassigned cause.....	5-17
Collisions—	
Rear collisions.....	3
Crossing collisions.....	2
Head collisions.....	4-9
Breaking of bridge.....	3
Breaking of axle.....	1
Breaking of rail.....	1
Total.....	31

Accidents by cattle again appear most numerous, and every one of the eight cases reported caused death or injury, in all nine deaths and the wounding of five. The collisions, except in two cases, caused personal injury, in all 14 deaths and the injury of 33, head collisions alone having killed seven and injured 30. By the failure of bridges 12 were killed and 16 injured. No one was hurt by the accidents caused by the broken rail and the broken axle. Of the five deraillments for which no cause is assigned, one resulted in the injury of eight persons; the others were harmless.

For the six months past the record is as follows:

	No. of Accidents.	Killed.	Injured.
February.....	21	18	125
March.....	27	3	67
April.....	22	13	32
May.....	27	9	33
June.....	44	63	114
July.....	31	35	66
Totals.....	172	141	440

We see, therefore, that July exceeds all the other months, except June, in the number and fatality of its accidents; June having been exceptional and extraordinary. Our record gives one accident for every day in July with an average of 1.13 killed and 2.13 injured by each.

General Railroad News.

CHICAGO RAILROAD NEWS.

Michigan Central.

The Jackson (Mich.) correspondent of the Detroit Tribune says:

"The Michigan Central is about to erect a new passenger depot here. The length of the building will be 294 feet. It will be one story in height, with the exception of about 24 feet at each end, where there will be two stories. The width will be 40 feet, and height about 22 feet; the two-story ends will be about 36 feet high. There will be a veranda, supported by iron pillars, along the whole southern side, 25 feet in width, and projecting far enough over the coaches, as they stand upon the track, to protect those entering or leaving them from the rain or sun. There will also be a veranda on the north or Main street front, extending about 150 feet, 16 feet in width. The foundation will be of Joliet cut stone, the walls of brick, with cut stone facings, and the roof of slate. The whole inside of the building will be finished with ash and black walnut. After the new building is completed the old passenger house now in use will be torn down, and all the tracks crossing Main street, with the exception of two, will be taken up."

Chicago, Burlington & Quincy.

The injunction prohibiting the Illinois Central Company making a contract with the Chicago, Burlington & Quincy road to run passenger cars by way of Aurora, Forreston and Freeport to Dunleith, having been dissolved, the Chicago, Burlington & Quincy commenced running two through passenger trains, with sleeping cars attached, from this city to Dubuque, taking the Chicago & Iowa road from Aurora to Forreston. This arrangement went into effect on Sunday evening, August 3. The trains leave at 7 a. m. and 2 p. m., and arrive at 9:15 a. m. and 9:15 p. m. Freight has been transported on this line for some time past.

The passenger business on the new Dubuque line is good and fully equal to the expectations of the company. The Chicago, Clinton & Dubuque road has reached Sabula, and will be finished to Clinton within a month. The Chicago, Dubuque & Minnesota road is open to the Minnesota State line, and will be finished to La Crescent within about a month.

Freight.

West bound freight from New York to Chicago has had the rates reduced since August 1 to the following: First class, 75 cents; second class, 70 cents; third class, 60 cents; fourth class, 45 cents; special, 35 cents.

Lake Shore & Michigan Southern.

W. H. Kneff, agent at Salem Crossing, has been appointed Ticket Master on the Air Line Division, and Mr. Shepherd, the ticket agent at Grand Rapids, takes his place as agent at Salem Crossing.

This company is pushing forward as rapidly as possible the double tracking of the road, and by another year will have a double track from this city to Buffalo, the entire length of the line. A rumor, which was quite widely circulated, that Mr. Paine was about to resign the office of General Superintendent of this road, has been authoritatively contradicted by Mr. Paine.

Chicago & Pacific.

This company is at work at grading all along the line from Chicago to within a few miles of Elgin. It has been proposed to locate the car shops at Elgin, and to run the line through the city in the most convenient manner, if the citizens subscribe \$100,000 to the stock. The prospect is said to be good that such a subscription will be made. The bridges over the North Branch of Chicago River will be done by the first of September, and the road laid to the city limits. By the first of October it is expected that the track will be laid to Des Plaines.

Chicago & Northwestern.

This company will, on the 15th of October, connect their Baraboo line (Madison Extension) with the West Wisconsin at Elroy, to which latter point that road will have its track laid at that time. This will give the Chicago & Northwestern a short road to St. Paul, and the company will be able to take its own time to complete the road to Winona Junction. Work in the tunnels is progressing with satisfactory rapidity. The Winona & St. Peter Extension is going ahead very rapidly, and as fast as the track is laid new settlers come in and take up the land along the line. By the time the road is completed to the Dakota line the country will have got pretty well settled, and will afford a very fair beginning of business. The business of this road is constantly increasing. The two large grain elevators in the North Division will be done in time to accommodate the fall grain trade. It should be stated that the road takes passengers by rail from Chicago to Marinette, fifty miles farther than Fort Howard, although tickets still read Fort Howard as the terminus of the main portion of the Wisconsin Division. Tickets for Fort Howard are good to Marinette.

Chicago & Alton.

The report of the earnings of this road for July is as follows: Earnings, 1872, \$482,987.26; for 1871, \$538,654.78—a decrease of \$55,667.52 from the business of the same month last year.

The falling off in earnings on this road is largely due to the want of facilities in Chicago for the storage of grain. This need, however, being rapidly met by new elevators which are approaching completion on the South Branch of the river. The high rates charged for storage in this city, as compared with Toledo rates, also are a constant obstacle in the way of the north-and-south roads in their competition with east-and-west roads for the grain business.

The St. Louis people—at least, some of the editors—have been charging that this company discriminates against St. Louis and in favor of Chicago in its freight rates. The company's officers hereupon asked an investigation, a committee of the Merchants' Exchange was appointed to inquire into the matter, and this committee reported that the charges made have no foundation in fact and were based on erroneous information.

St. Louis may rest assured that the Chicago & Alton and other companies will carry traffic wherever it wants to go for the rates it is willing to pay; and if there is any difference in rates for equal distances in the two directions, it will probably be in favor of that direction in which most cars are hauled empty—and that is not toward Chicago.

Postal service has been ordered on the newly completed line from Mexico to Jefferson City, Mo., 50½ miles.

Chicago, Danville & Vincennes.

A time-table is being constructed for through trains from this city to Evansville, and within a few days trains will run with first-class accommodations to the latter point, and connecting thence with the Nashville Division of the St. Louis & South-eastern for Nashville. The distance from Chicago to Evansville by this route is 292 miles, and to Nashville 450 miles, there being a change of cars at Evansville only.

Pittsburgh, Cincinnati & St. Louis.

The trains from Chicago, on this road to Louisville and the South, will hereafter run by way of Kokomo, leaving Chicago at 7:40 a. m. and 6:40 p. m. This route is much better than the old one, and the change will be regarded by the public with favor.

Illinois Central.

The company have been awarded the contract for building another large section of the outer breakwater, which is in progress from a point opposite the mouth of the harbor southward for about a mile.

ELECTIONS AND APPOINTMENTS.

—At the annual meeting of the Cape May & Millville Railroad Company, August 7, the following directors were elected: Thomas Jones York, Edmund Smith, Albert W. Markley, Charles P. Stratton, George B. Roberts, James H. Stevens, Coleman F. Leaming, Jacob F. Cake and Edmund L. B. Wales. The board elected T. Jones York, President; George J. Robbins, Secretary, and Benjamin F. Lee, Treasurer. Mr. York is President of the West Jersey Company.

—The annual meeting of the stockholders of the Gilman, Clinton & Springfield Railroad was held in Springfield, Ill., August 6. The stock represented was 14,326 shares out of 20,000. The board of directors (re-elected) are: S. H. Melvin, George N. Black, J. T. Stuart, John Williams, Springfield, Ill.; C. H. Moore, William Fuller, D. A. Rosecranz, Clinton, Ill.; D. L. Beidler, Mount Pleasant, Ill.; E. Wenger, Gilman, Ill.; A. S. Guthrie, Gibson, Ill.; John A. Chestnut. The directors re-elected the following officers: S. H. Melvin, President; William Fuller, Vice-President; George Black, Treasurer; J. W. Lane, Secretary.

—Mr. W. O. Lewis, until recently General Freight Agent of the Missouri Pacific Railroad, has been appointed Contracting Agent in St. Louis for the St. Louis, Kansas City & Northern Company.

—A meeting of the stockholders of the Cleveland & Mahoning Valley Railway Company, recently formed by the consolidation of the Cleveland & Mahoning, the Niles & New Lisbon, and the Liberty & Vienna railroad companies, was held in Cleveland, August 7, and the following board of directors elected: Henry E. Parsons, Ashtabula, Ohio; John Tod, Cleveland, Ohio; W. C. Andrews, Cleveland, Ohio; V. Hitchcock, Painesville, Ohio; W. P. Ewing, Ashtabula, Ohio; A. H. Spencer, Cleveland, Ohio; S. L. M. Barlow, New York City; Daniel Day, Niles, Ohio; Stevenson Burke, Cleveland, Ohio. The board of directors subsequently elected the following officers: President and Treasurer, Henry E. Parsons; Vice-President, A. K. Spencer; Secretary, Daniel J. Day.

—At a recent meeting of the stockholders of the Bangor & Calais Shore Line Railroad Company, at Cherryfield, Me., the following directors were elected: George W. Ladd, Charles P. Brown, Bangor; Seth Tisdale, Ellsworth; Charles Deering, Portland; S. N. Campbell, James W. Moore, Cherryfield; George Walker, Machias; John C. Talbot, East Machias; Daniel J. Sawyer, Jonesport.

—The directors of the New York, New Haven & Hartford Railroad Company met at New Haven, August 7, and elected the following officers: President, William D. Bishop; Vice-President, William P. Burrall; Treasurer, John P. Shelton; Secretary, Judge Edward I. Sanford. Messrs. Bishop, Shelton and Sanford held the same positions in the New York & New Haven Company, and Mr. Burrall was President of the Hartford & New Haven Company.

—At the annual meeting of the Athol & Enfield Railroad Company at Athol Depot, Mass., August 6, the following board of directors was elected: Willis Phelps, Homer Foot, William Birnie and Charles R. Ladd, of Springfield; Rufus D. Woods and Edward Smith, of Enfield; John C. Hill and Thomas H. Goodspeed, of Athol; Stephen P. Bailey, of Greenwich; J. Wesley Goodman, of North Dana; and Samuel Adams, of New Salem. The directors elected Willis Phelps President, Rufus D. Woods Vice-President, and Thomas H. Goodspeed Secretary and Treasurer. 4,188 shares were voted on. Mayor Spooner represented the city of Springfield, which is now a large stockholder. Messrs. Foot, Birnie and Ladd are new members of the board, replacing Messrs. Kimball, Southworth and Allen. The new members represent the Springfield interest in the road.

—Mr. A. W. Dickinson, late Division Superintendent of the Missouri Pacific Railroad at Kansas City, has been appointed Assistant General Superintendent of the Atlantic & Pacific and Missouri Pacific roads. Mr. Dickinson is succeeded as Division Superintendent by Mr. Whitbeck.

—Mr. W. H. Brown has been appointed Superintendent of the Bedford Division of the Pennsylvania Railroad, which consists of the newly leased Bedford & Bridgeport Railroad. Mr. P. F. Smith has been appointed Superintendent of the Lewistown Division, in place of Mr. Brown, transferred to the Bedford Division.

—A circular from General Superintendent Towne, dated July 26, announces that Mr. O. B. Carr having resigned the office of Assistant Division Superintendent of the Truckee Division of the Central Pacific Railroad, Mr. Frank Free, who has been appointed his successor, was to assume the duties of that department August 5, 1873.

—Mr. W. E. Phelps, late General Ticket Agent of the Louisville, New Albany & Chicago Railroad, has accepted the same position on the Cincinnati & Terre Haute line.

—Mr. Andrew H. Northrup, of Brookfield, has been appointed a Railroad Commissioner of the State of Connecticut.

—Col. George H. Smith, Superintendent of Horse Railroads in Providence, R. I., has accepted an appointment of Superintendent of tramways in London.

TRAFFIC AND EARNINGS.

—The earnings of the Central Pacific Railroad have been:

	1870.	1871.	1872.	
For the month of July.....	\$783,99	\$899,296	\$1,173,295	
For the seven months.....	4,210,425	4,914,178	6,767,778	
	1871 over 1870. p. c.	1872 over 1871. p. c.		
July increase.....	\$86,197	11	\$305,999	35
Seven months increase.....	703,693	16½	1,853,600	37½

This company operated in July 1,366 miles of road, but that owned by it, from which the earnings reported came (we suppose), included 1,166 miles. The California Pacific (100 miles), the San Francisco & North Pacific (56 miles), and the Stockton & Copperopolis (49 miles) are still distinct companies. The mileage in operation last year was 984 miles.

The earnings of the Great Western Railway of Canada for the week ending July 19 were: 1872, £19,647; 1871, £17,271; increase, £2,376, or 13½ per cent.

The earnings of the Grand Trunk Railway of Canada for the week ending July 20 were: 1872, £35,000; 1871, £32,700; increase, £2,300, or 7 per cent.

The earnings of the St. Louis, Kansas City & Northern Railway for the first week in August were: 1872, \$74,715; 1871, \$41,740; increase, \$32,975, or 79 per cent.

The earnings of the Pacific Railroad of Missouri for the month of July were: 1872, \$265,406; 1871, \$278,172; decrease, \$12,766, or 4½ per cent. The earnings of the same road for the first five months of the fiscal year, beginning March 1, were: 1872, \$1,444,267; 1871, \$1,409,257; increase, \$35,010, or 2½ per cent.

The earnings of the Burlington, Cedar Rapids & Minnesota Railroad for the month of May were: 1872, \$67,725; 1871, \$30,144; increase, \$37,581, or 124½ per cent. For the month of June the earnings were: 1872, \$74,242; 1871, \$31,504; increase, \$42,738, or 135½ per cent. For the month of July: 1872, \$73,834; 1871, \$30,034; increase, \$43,800, or 146 per cent. The increase in mileage during the year was about 40 per cent.

The earnings of the Great Western Railway of Canada for the week ending July 26 were: 1872, £19,274; 1871, £18,418; increase, £856, or 4½ per cent.

The earnings of the Grand Trunk Railway for the week ending July 7 were: 1872, £34,900; 1871, £31,900; increase, £3,000, or 9½ per cent.

PERSONAL.

An English journal recently spoke of General Dix as having commanded a division "in the Revolutionary war," and now, as though bound to superannuate the entire Erie directory, another journal says (taking the usual liberty with the gentleman's name): "H. O. Watson, brother-in-law of ex-Secretary Stanton and a soldier of the Revolutionary war, has been elected President of the Erie Railroad."

The ranks of railroad directors and officers have been invaded by one Ruth Clark, who appears as a director and the Treasurer of the Chicago, Omaha & St. Joseph Railroad Company.

Mr. Wm. Bridges Adams, one of the most eminent of English engineers, long a manufacturer of railroad rolling stock, in which he introduced many improvements, and the inventor of the fish-joint, now almost universally used, died at Broadstairs, England, July 23, aged 75 years.

George Black, one of the directors of the Pennsylvania Railroad Company, of the iron manufacturing firm of Lloyd & Black, Pittsburgh, died at his home in Pittsburgh August 5.

Rush R. Sloane, President and Superintendent of the Cincinnati, Sandusky & Cleveland Railroad, has been nominated for Congress by the Democrats of the tenth Ohio district.

Hugh J. Jewett, President of the Central Ohio and the Cincinnati & Muskingum Valley railroad companies, has been nominated for Congress by the Liberals and Democrats in the Twelfth Ohio (Columbus) District.

THE SCRAP HEAP.

Arbitration.

A bill has been prepared and brought into the English House of Commons to facilitate arbitration between employers and employed. The two parties, it is proposed by the bill, may agree to the time, manner and appointment of a board, council, person or persons to act as arbitrators in matters of dispute between them; to the appointment of an umpire to bind themselves by agreements, which shall remain in force subject to certain notices, to give exclusive jurisdiction to the arbitrators or umpire, and to accept their decision as final and binding, provided the matter in dispute shall be heard and determined within seven days of the time at which it may arise. Power is also given to the arbitrators to call for witnesses, books, documents and accounts.

Prices of Rails in July.

Bigelow & Johnston, of No. 48 Pine street, New York, report as follows the prices current of rails for the month of July:

	Gold.	Currency.	Import, Ton.
New Rails.			
English.....	\$72 @ 73		11,828
American.....	\$85 @ 90		
Total import this month.....			11,828
Import since January 1.....			88,491
Total to date.....			100,319
Same time 1871.....			96,971
Old Rails.			
Double heads.....	\$51 @ 52		
T or Flange.....	\$50		
U or Bridge.....	Nominal.		4,213
Total import this month.....			4,213
Import since January 1.....			27,734
Total to date.....			31,747
Same time 1871.....			19,887

"New Rails.—There has been a very fair business during the month at prices within the range of our quotations, closing with a very firm feeling in foreign.

"Old Rails.—Without much increase in business done, there is a gradually hardening tendency."

A Drawing by George Stephenson.

John B. Winslow, Superintendent of the Boston & Lowell road, has presented by a letter to the Middlesex Mechanics' Association of Lowell an original railroad drawing by George Stephenson. It bears the original autograph of the great engineer.

Patent Extensions.

The following applications for extensions of railroad patents have been made. Those opposed to the extension can have a hearing on the dates given:

Couplers for railroad cars; granted to F. R. Myers and F. H. Furness, September 7, 1855. Hearing August 21.

Tempering steel for car springs; granted September 28, 1858, to Perry G. Gardner. Hearing September 11.

Trucks for locomotive engines; granted to Levi Bissell, November 2, 1858. Hearing October 16.

Car springs; granted to Perry G. Gardner, November 2, 1858. Hearing October 16.

The following extensions have been granted:

Improved railroad switch, by George R. Smith; improvement in sleeping cars, to Eli Wheeler.

Are Tickets Good for All Trains?

The Springfield Republican says: "The New York & New Haven Railroad has another suit on its hands, Francis A. Hunt, of New York, laying damages at \$10,000 for being ejected from the cars at South Norwalk, November 10. Mr. Hunt bought a ticket for New York at Providence, and got off at Bridgeport,

having received a check in return for his ticket. On taking the next train the conductor refused to accept the check, and as Mr. Hunt refused to pay, he called two policemen and ordered him to be put in jail at South Norwalk, where he was confined for six hours. The company claim that Mr. Hunt's ticket was an excursion ticket, and that Mr. Hunt had no business on an express train without paying full fare."

New Railroad Patents.

The following patents have been issued, bearing date of July 23, 1872:

Car-wheel, to Thomas C. Cramer, Albany, N. Y., assignor to James A. Woodbury, Winchester, Mass. Car coupling to Chas. B. Knowles, Nashville, Tenn. Crossing frog, to Samuel L. Phelps, assignor to John Dekam, Kalamazoo, Mich. Chair for street railroads, to William Warner, Philadelphia. Locomotive, to Harry Whitaker, New York. Nut lock for fish bars, to Francis H. Bradley, Mystic River, Conn. Combined car brake and starter, to Chas. B. Broadwell, New Orleans. Car brake, to Samuel F. Clouser, Salt Lake City, Utah. Locomotive signal-light, to Andrew Dick, Hamilton, Ont. Steam car, to Henry F. Knapp, New York. Car brake, to William Naylor, Mildmay Park, England. Steam and air car brake, to John Y. Smith, Pittsburgh, Pa. Railroad signal, to William Wickersham, Boston.

Breakage of Rails in England.

From the following extract from *Engineering* it would seem that, although the breakage of rails is perhaps not so common in England as in this country, such accidents do occur with more or less frequency:

"In a Parliamentary paper just issued, the report of Colonel Rich, C. E., gives the result of his inquiry into the circumstances connected with the large number of rails broken on the Caledonian Railway during the past winter and spring. Colonel Rich also reports on the accident on the 15th of March to the up-mail train in the Mill of Ash Tunnel on the Caledonian Railway, by which three passengers were hurt. The accident resulted from one of the rails having broken. Those breakages must be attributed to the rails being of rather a hard description, and to their being much worn. It is recommended that those parts of the railway on which express trains run, and where the rails have proved brittle, should be renewed as soon as possible."

Growth of Freight Traffic.

The proportion of receipts from freight to those from passengers on our railroads at present is probably as great as it was to one; but in the early days of railroads freight was hardly thought of. This is illustrated by the following story, which is told by the *Syracuse Courier* after noting large purchase of lands in that city and other arrangements by the New York Central & Hudson River Railroad Company to largely increase its capacity for handling freight:

"Most of our citizens will remember when the Central freight was very limited. The late John Wilkinson was approached in his office one day by a farmer, who asked him to build a car to carry produce from country stations into Syracuse. Mr. Wilkinson replied, 'This road was built to carry passengers, not freight. But the farmers began to burden the small passenger cars with baskets of eggs and pots of butter, until at last Mr. Wilkinson, concluded to do something. He constructed a small flat car with a small railing around it. After it was built, he had it drawn into the depot, and hundreds of citizens visited it as a curiosity. The farmer who first asked for a freight car came in from the country with a host of friends. Mr. Wilkinson came down from his office and said to the farmers, 'You wanted a freight car. There is one. It will draw all the freight you can furnish.' This was the first freight car ever run through this city—and from this small beginning has grown the immense freight business of the New York Central Railroad."

Storing Grain.

The *Engineer* reports that M. Lovell has brought before the French Academy a plan of storing wheat in portable sheet-iron granaries, in which a vacuum is maintained equal to at least from three to four inches of mercury, this being found sufficient to destroy all insect life (although a more perfect vacuum is preferred) and to insure the evaporation of any moisture in the grain. The apparatus is of cylindrical form, placed vertically, and with convex top and bottom. The top is provided with an opening, through which the inlet of the grain is led, with a valve pipe through which the air is exhausted, and with a gauge by which the degree of exhaustion is indicated. The grain is removed through an opening in the bottom. In an experiment, where living insects were introduced in large quantities with the grain, it was found that they were all killed before doing mischief, and at the end of six months the wheat was found to be in as fine condition as at the outset.

OLD AND NEW ROADS.

Boston & Maine.

An exchange says: "Dover owns 2,626 shares in the Boston & Maine Railroad, Exeter 1,692, Portsmouth 823, Stratham 688, Greenland 141, Hampton Falls 147. The largest stockholder in New Hampshire owns 185 shares."

Nashua & Rochester.

Work is to begin very soon at Rochester.

Providence & Worcester.

The second track is complete to Saundersville, nine miles from Worcester.

Buffalo, New York & Philadelphia.

An excursion train from Buffalo passed over this road, August 13, to celebrate the opening of the road from Olean, the late terminus, to the Pennsylvania State line, a distance of about 10 miles.

Central Pacific.

It is reported that this company is about to construct a branch road from Toano, Nevada, 183 miles west of Ogden, southeast to Tintic, in Utah Territory.

Jefferson City & Southwestern.

Camman & Co., who have the contract to complete the grading of this road, and to iron, stock and run the road, are reported to have sub-let the grading, within two days after receiving the first proposal.

Western Narrow Gauge.

The Houston (Texas) *Telegraph* says that the charter of this road required that twenty miles should be completed by August 1, but that it also provided that Judge Masterson might extend the time, and he has, accordingly, extended the time for the completion of the first twenty miles to April 1, 1873.

Union Pacific.

It is said that this company is about to iron a branch already graded from the main line to Coalville, and thus secure access to the large deposits of coal there.

Missouri River, Fort Scott & Gulf.

The machine shops of this road are not to be located in Fort Scott as was lately reported. An old contract has been discovered which obliges the road to build its shops at Kansas

City. The Fort Scott people are badly disappointed and comment strongly on the mysterious loss and sudden recovery of the old contract.

Connecticut Western.

At a meeting of the board of directors at Hartford, August 8, a resolution to accept the proposition before the board, to construct the branch from Tariffville to Springfield at once, was lost.

Chicago & Southwestern.

The new depot at Sixth street, Leavenworth, is finished and will be occupied at once.

Springfield & Jerseyville.

It is said that the company will be ready to let the contracts for the line from Springfield southwest to Jerseyville, Ill., next month.

Peoria & Springfield.

It is reported that work on the grading of this line is progressing rapidly.

Texas & Pacific.

An agent of this company has asked for a subsidy of \$150,000 in bonds from Lamar County, Texas, for the Trans-Continental Division. This subsidy is strongly opposed, on the ground that the State has already granted a subsidy of \$10,000 per mile to the Trans-Continental road, provided it is finished to Fort Worth by June 1, 1874, and, consequently, the road must be built by the Texas & Pacific Company, whether it receives aid from the counties or not, unless it chooses to forfeit the State aid, which will amount altogether to \$3,000,000. It is possible, however, that the charter does not obligate the company to build the road through Paris, or to build a depot there, which is the consideration offered in return for the subsidy asked for from the county.

Pennsylvania Petroleum.

The route of this new road is described as follows: "The road starts at Tidouste, on the Alleghany River; extends up Gordon's run to a short distance from the town of Triumph; passes on through the Fagundas oil district to Pine Creek; down that stream through the Colorado district to where it forms a junction with the Pithole Railway, via Pleasantville, and thence to Enterprise and Titusville." From Titusville the road will continue up Oil Creek, Marsh Run and Muddy Creek to Cambridge Station, on the Atlantic & Great Western road, whence it will be eventually extended to Erie, Pa. From Tidouste to Titusville by this road the distance is 17 miles, the present route by the Oil Creek & Alleghany River road being 38 miles long. From Tidouste to Erie the distance is 84 miles. The stock of this company is all held in England and it is understood that it is controlled by James McHenry and the Atlantic & Great Western interest, and that the latter company is going to make a strong effort to secure the larger share of the petroleum traffic.

National.

A number of sections of this road between the Delaware River and Bound Brook have been sub-let by Driesbach & Co., the original contractors. W. J. Connor & Co., of Mauch Chunk, took two sections of three miles each, beginning at the Delaware, and including the masonry for the bridge over that river. The bridge is located one mile below Yardleyville and three miles above Trenton, to which place a branch line will be built. The contractors are to begin work at once, and the sections are to be completed by January 1, 1873. The sub-contracts for the portion of the line between Yardleyville and Philadelphia are to be let this week by McGrann & Co., the general contractors for that section. It is reported that the company has issued bonds to the amount of \$5,000,000, which are to be placed on the market at once. The officers of the company are: President, W. G. Case, of Columbia, Pa.; Vice-President, Henry M. Hamilton, of Philadelphia; Treasurer, Jacob Riegel, of Philadelphia; Secretary, R. B. Corson, of Philadelphia; Chief Engineer, Isaac B. Culver, of Jersey City.

Northern Pacific—Pacific Division.

The Kalama (Wash. T.) *Beacon* says that grading is proceeding rapidly. The road is graded to Newaukum, and the force of men on that part of the line has been moved forward to McDonald's. The abutments for the bridge over the Cowlitz at Pumphrey's are completed, and work has been commenced on the center pier, which will be completed in about three weeks. Orders have been received to build 350 box and platform cars and a sufficient number of passenger cars; patterns and drawings having been sent from the East. The machinery for the car-shops at Kalama is daily expected, and as soon as it arrives and is set up car manufacture will proceed at the rate of fifteen per week. Trains are run daily to the end of the track. We give the stations and distances from Kalama: Carroll's, 5 miles; Montello, 9; Cowlitz, 12; Castle Rock, 20; Gravel Pit, 23; end of track, 25.

Kansas Pacific.

Work on the Junction City & Fort Kearney Branch is being pushed rapidly forward. The grading is completed for 33 miles, and the track will be pushed to Oay Centre, 30 miles, at once. This line runs up the Republican Valley and will be an important feeder to the main line. The line from Carson, southwest to Fort Lyon, Col., about 51 miles, has been begun with a small force. This branch will be used almost exclusively for the cattle trade, but it will also help to secure the New Mexican trade.

Chicago & Southwestern.

A difficulty having arisen between the Fort Leavenworth Railroad Company, which built the road across the military reservation at Leavenworth, and Foote & Geiger, the contractors, as to the final payment on the work, the contractors, with a large force of their men, removed a number of rails on the afternoon of August 9. The rails were, however, relaid by the railroad track-men the same night in time to avoid any interruption to passenger travel. The difficulty was entirely of a personal nature, no local issues being involved.

Detroit & Bay City.

The iron is reported laid from Detroit to Utica, Mich.

Saginaw Valley & St. Louis.

This company has concluded a contract with the Cleveland & Lake Superior Iron Company, of Cleveland, for iron enough to complete the road, 300 tons to be delivered August 10, and 200 to 300 tons monthly thereafter, as required.

Missouri, Kansas & Texas.

The trains on this road were to commence running to Atoka, on the South Boggy, August 15. Work is being extended all along the line to the Red River, and the construction of the bridge across that stream has been commenced. The Texas travel over the road is rapidly increasing.

Inclined Railroad near Vienna.

An inclined railroad is now in course of construction up the side of Mount Kohlberg, near Vienna, Austria. It is to be completed by the time the exposition opens next year. Mr. Francis Felbinger, late of the Pittsburgh, Fort Wayne & Chicago Railway, is the constructing engineer. The track is to be of six feet gauge. The cars are to carry 100 passengers each, and are to be drawn up by means of wire ropes, drums and stationary engines. Two stationary engines of 100 horse-power each are to be employed.

California, Atlantic & Pacific.

This company, which intended to construct the California end of the Atlantic & Pacific Railroad, and eventually be consolidated with that company, was incorporated in California August 10, with Messrs. Alvin Hayward, R. G. Sneath, J. C. Seligman (of Seligman Bros., Bankers), W. P. Jones, J. C. Merrill, M. J. O'Connor, J. Bentley, Richard Tobin, Judge J. M. Hager and Albert Dibalee as directors on the part of San Francisco, and Mayor Brown and Messrs. Coffin and Pierce on the part of St. Louis.

The private subscriptions to the stock of this company, in San Francisco, amount to about a million and a quarter, Alvin Hayward having increased his subscription from \$100,000 to \$500,000. It is expected that the city of San Francisco will subscribe \$10,000,000, as authorized by an act of the last Legislature.

Hartford & New Haven.

The payment to the stockholders of \$10.33 per share, as guaranteed by the terms of the consolidation with the New York & New Haven Company, will be made on and after August 15, at the usual place of paying dividends. The transfer books are closed until further notice to give time for the preparation of new certificates in the consolidated company.

New York, Housatonic & Northern.

A meeting of the stockholders of this company is called for September 10, to be held at the company's office, No. 137 Broadway, New York, to take action on the amendment of the charter passed by the Legislature of Connecticut at the May session; and also to vote on an agreement of consolidation with the Southern Westchester Railroad Company.

Southern Westchester.

A meeting of this company is called for September 10 at the company's office, No. 141 Broadway, New York, to consider an agreement of consolidation with the New York, Housatonic & Northern Railroad Company.

Toledo, Thorntown & St. Louis.

A commencement of work on the Illinois Division of this road was made at Shelbyville, Ill., August 8.

Pacific of Missouri.

The constant running of locomotives and freight trains through Poplar street in St. Louis interferes so much with the rapidly increasing traffic of the city that a movement is on foot to have bridges erected over the railroad at the various street crossings. Meetings have been held and committees appointed to take the necessary preliminary steps.

Italian Railroads.

The Italian railroads for the first five months of the year had a total length of 4,149 miles, against 3,919 in 1871. The receipts for that period were \$9,222,382 in 1872 and \$8,021,869 in 1871—\$2,222 per mile in 1872 and \$2,047 per mile in 1871.

Toledo, Peoria & Warsaw.

At a late meeting of the stock and bondholders of this company, it was resolved that no more first preferred stock should be exchanged for the bonds dated April 2, 1866, but that the bonds might be exchanged for the first preferred stock. The bonds must be surrendered on or before the first day of September, 1872.

Philadelphia, Westchester & Downingtown.

The board of directors of this company have finally adopted the route by way of Crum Creek Valley and Cox's Gap, north of Sugarloaf. Contracts for the road from Philadelphia to Westchester are to be let as soon as possible.

Berks County.

The length of this road from Reading to Slatington, on the Lehigh Valley road, is about 40 miles, passing through Stineville, Lynnpott and Tripoli, the route being north by east from Reading. One-half the road is under contract and work is just begun. The remaining 20 miles is to be let within 60 days. It is intended to have trains running within a year. It is expected that the road will have a large traffic in coal and slate. The officers of the company are: President, Henry Bushong; Chief Engineer, J. Dutton Steele; Engineer in charge, Thomas C. Steele; Engineer in charge of surveys, T. O. Garrington.

Philadelphia & Newtown.

Work on this road has been commenced at Crescentville, Olney, Fox Chase and Huntingdon. The contract for the whole road is let to James M. Sellers & Co. The line starts from Second street and Lehigh avenue, in Philadelphia, and runs north to Olney direct, thence to Milltown, thence to Fox Chase, thence, via Huntingdon Valley, Davisville, Southampton, Churchville, Addenville, to Newtown, thence to the Delaware River, where it will connect with the Mercer & Somerset Railroad, which, if completed, would afford a route to New York by way of Millstone and New Brunswick. The route through which the road runs is one of the wealthiest around Philadelphia, and opens an entirely new country a few miles back from the Delaware.

Canada, Michigan & Chicago.

This company has let a general contract for the construction of the line from St. Clair to Lansing, Mich., and the line from St. Clair west to Ridgeway, about 10 miles, is sub-let, and the work of grading it is being prosecuted by a force of something like a hundred men.

Michigan Midland.

This company, whose route is almost identical with that of the Canada, Michigan & Chicago, from St. Clair, Mich., westward, is prosecuting the work of grading between St. Clair and Ridgeway, as is the latter company—not, however, with a force of a thousand men, as has been reported, but with a small force. The two companies are rivals for the route, and each avers it desires (and expects, perhaps) the dissolution of the other, and that one should die is absolutely necessary to the welfare of the other, as three roads on the same line, with a third close by, if the Michigan Air Line carries out its plans, would find very poor pickings in this part of Michigan.

Pennsylvania & Delaware.

It is intended to have the cars running from Pomeroy (42 miles from Philadelphia on the Pennsylvania Railroad) southward to the Delaware line by September 15.

Wilmington & Reading.

The grading on the extension of this road from Birdsboro to Reading is going ahead rapidly, and the whole line will shortly be ready for the rails.

Springfield & Northwestern.

The contract is reported to have been let for the construction of the uncompleted section of this road, between Springfield and Petersburg, Ill.

Iowa Central.

A survey has been commenced for a road from Albia to Centerville. It is not decided yet at what point the line will leave the old Moulton grade. Some heavy work will have to be done between Centerville and the State line, where the road is to connect with the St. Louis, Kansas City & Northern road.

Ottawa.

Contracts for building this road from Salamanca to Machias, N. Y., have been let. That for clearing, grubbing and masonry has been given to Harris Brothers, of Buffalo.

Central of New Jersey.

The Bucks County (Pa.) *Mirror* says that trouble has arisen between this company and the Lehigh Valley. The latter company, which controls the North Pennsylvania, refuses to allow the trains on that road to connect with those on the Central's Lehigh & Susquehanna Division at Bethlehem, and the Central will not connect with the Lehigh Valley trains at Easton. With this it is said that the Central, in connection with the Reading road, is about to complete a new route to Philadelphia. The track of the Lehigh & Susquehanna Division will be carried across the Lehigh at Allentown by a new bridge, and trains will run over the East Pennsylvania thence to Easton. From Easton to Perkiomen Junction the cars will be run over the Perkiomen road, which is to be completed to Emaus, 11 miles from its present terminus, at once. From Perkiomen Junction to Philadelphia, the Philadelphia & Reading road will be used. This distance from New York to Philadelphia by such a route would be about 160 miles.

La Crosse Bridge.

The board of engineers detailed by the Secretary of War to determine the location of the railroad bridge at La Crosse has made its report. The point selected for the bridge is at the foot of Mount Vernon street, in that city, and the decision is in accordance with the wishes of the people. The board consisted of Colonels Macomb, Weitzel and Merrill. The La Crosse *Republican* says:

"The site proposed by Engineer Dodge, of the Milwaukee & St. Paul Railway Company, a couple of miles north of the site selected by the Government engineers, is objectionable for many reasons: but chiefly because the banks and islands of the Mississippi in that vicinity are often overflowed to such an extent as to render it difficult for navigators to have any accurate information as to the channel; and the bridge, if located there, would, besides increasing the hazards of navigation, require two draws, over Mississippi and Black rivers, and prevent convenient access to it by other railways on both sides of the Mississippi. It would also require much grading in making approaches to the bridge on either side of the river. The site selected by the Government engineers is at a point that is accessible to and by all of the railroads centering at La Crosse; and is where the channel can never change, being favored by good banks and a straight current."

New Castle & Franklin.

The contracts for grading and bridging over 22 sections of this road were let last week. All the work is to be ready for the ties by April 1, 1873. Work has commenced near New Castle, Pa. The third installment of 10 per cent. on the stock has been called in. The general direction of the line is from New Castle, on the Fort Wayne road, northeastward.

Union Railroad at Baltimore.

The Baltimore *Gazette* says: "The work on the tunnel is progressing as rapidly as practicable, and there is every possibility that it will be completed so that the whole line from Canton to its intersection with the Northern Central Railway, near Belvidere Bridge, will be in working order by the close of the present year. Large numbers of men are employed at the several points of operation, and temporary tracks have been laid by which the earth is removed from the cranes by which it is hoisted out. As fast as the excavations are completed the brick work is put up in the most substantial character, and the arch is covered with a bed of stone laid in concrete. The greater part of the road is graded from Canton to the tunnel, so that little else will be required after the tunnel but to lay the tracks. There will be a double track the entire distance." Arrangements have been made for extensive coal docks at Canton, as anthracite coal will be a large part of the traffic.

Mackinac, La Porte & Wanatah.

A company has been organized in Indiana to construct a road from the Indiana State north line via La Porte to Wanatah, Ind., where it will connect with the Pittsburgh, Fort Wayne & Chicago Railway. The capital stock is \$200,000 in shares of \$50 each, and the board of directors consists of thirteen members, as follows: Caleb B. Davis and Jas. H. Francis, Galena; Jacob R. Hall and Daniel Kimball, Scipio; E. S. Gardner, Clinton; F. McCurdy, Cass; Calista Preston, Kankakee; L. Crane, W. A. Place, A. L. Weaver, Jacob Wile, Jas. A. Crawley and A. P. Andrew, Center. The company purpose to ask aid from the towns along the line. This line is the remaining link in the line from Grand Rapids to Chicago, by way of Monticello, a Michigan company having been formed some time ago.

Bedford & Bridgeport.

The Pennsylvania Railroad Company has leased this road, from Dallas to the Maryland line, for two years from August 1. The lessees will furnish the rolling stock. The ballasting is proceeding rapidly and the road will be ready for travel in time for the fall trade.

Peachbottom.

The contract for the construction of the Eastern Division, from Peachbottom, on the Susquehanna, east to Oxford, Chester County, Pa., about 13 miles, has been let to Clark, Smith & Co., of Philadelphia, who are to have the grading and masonry complete by August 1, 1873. The estimated cost of the grading and masonry is \$54,600, and \$62,000 in stock has been subscribed east of the Susquehanna.

Northern Pacific.

The London *Times*, of July 27, says: "The Stock Exchange Committee have ordered the Northern Pacific Railroad first mortgage bonds to be quoted in the official lists."

The company reports three-fourths of the grading of the 200 miles between the Red River of the North and the Missouri as completed; the track laid and construction trains running for a considerable distance west of Red River; track going down at the rate of nearly two miles a day, to be completed to the Missouri before the end of October; and material to complete this section and equipment to work it already purchased.

Besides the sections completed and under contract, final surveys are being made for 836 miles, to make it ready to let, including a section from the Missouri westward to the crossing of the Yellowstone in Eastern Montana, and one west of the Rocky Mountains, from Lake Pond d'Oreille westward to the mouth of Snake River. When the road has been completed to the Missouri, it is reasonably expected that the road will command a large part of the Montana trade, during the season of navigation, which, however, is very short, as the Missouri usually is too shallow for navigation early in the summer.

On the Pacific coast 25 miles of the line, from the Columbia River north to Puget Sound, has been in operation since last year, and 40 miles more will soon be completed.

Considerable settlements have already been made on the cultivable lands of the company, from Crow Wing west to Red River, chiefly by Scandinavian immigrants.

Chicago, Danville & Vincennes.

The Danville *Commercial* says that the junction of the branch from Covington will be at Young's, 10 miles north of Danville, instead of at Gilbert Station, as originally intended.

Trenton & Freehold.

A railroad is projected to run from Trenton east to Freehold, N. J., by way of Allentown. The line would be about 28 miles long and would cross the Camden & Amboy near Newtown and the Pemberton & Hightstown about Sharon. It is proposed to connect at Freehold with the Freehold & Keyport road.

The National Railway.

The Philadelphia *Public Ledger* contains the following:

"The National Railway Company have executed a mortgage to the Union Trust Company of New York, as trustee, on a line of railway from Philadelphia to New York, constructed and to be constructed, to secure an issue of \$5,000,000 of 7 per cent. gold bonds. We do not know whether the active movers in this enterprise have any serious notion of constructing such a line or placing said loan upon the market; but an examination of the laws under which authority for such action is claimed, shows that such a mortgage and issue of bonds are hastily and improvidently made. In accepting the trust as it has, the trustee could not have critically examined the covenants of the mortgage that the powers claimed by the railway company actually existed. In order to make the bonds obligatory, it is the trustee's duty to certify 'the manner in which the bonds are secured by mortgage;' and though it is stipulated that the trustee 'shall not be liable nor responsible for any matter or thing connected with the trust, except for its own willful or intentional breaches,' there is at least a moral obligation by which every corporation or individual is bound in accepting a trust and in certifying to its character, to see that such trust should be free from any question or taint of uncertainty. We have been unable to obtain from the Auditor General's office any official information of the condition of the National Railway Company, or of the Attleboro Railroad Company, its predecessor, simply because their officers have never conformed to the imperative terms of the stringent laws requiring such companies to report annually the amount of capital stock authorized, the amount subscribed, the amount paid in, etc., etc. Such acts of omission, which involve heavy penalties, do not indicate a very careful regard for the interests of stockholders or of the State. The National Railway Company was originally the Attleboro Railroad Company, incorporated April 2, 1860, with an authorized capital stock of 3,000 shares of \$50 each, and authority to construct a road to connect with any point on the Delaware River and any railroad in Bucks County or the city of Philadelphia. A supplement of May 3, 1861, gave it authority to borrow \$300,000, with the privilege of increasing the amount in the same proportion as the amount of capital stock was increased. A supplement of 17th of April, 1866, authorized the company to construct a railroad from any point in the route authorized by the original act of incorporation, to connect with the North Pennsylvania Railroad at any point in Montgomery County, with the restriction that the road should not be constructed through Philadelphia below the village of Bustleton. A supplement of the 24th of March, 1868, extends the time for the commencement of the road three years, and for its completion with one track five years from the 2d day of April, 1868; it also authorizes by a majority vote of the stockholders an increase of capital stock and an issue of preferred stock 'of one or more classes, upon such terms as the company may deem best,' and extends the provisions of the General Railroad Law of 1819 and the supplements to said company. The name of the Attleboro Railroad Company was changed by the Court of Quarter Sessions of Bucks County, at the December term of 1868, to the National Railway Company, under which name it has merged the Middletown & Yardleyville Railroad Company, contracted a lease of the Stanhope Railroad—a New Jersey corporation—for 999 years, for the consideration of 'one dollar when demanded,' and executed the mortgage to secure the loan of five millions of dollars, as also perhaps the bonds. It is true the Courts of Quarter Sessions have power to change the name of any corporation within their respective counties, but this law applies only to that class of corporations created by the court of the county within which they are located, such as charitable, religious and literary corporations, and is not applicable to corporations created by the Legislature, such as the Attleboro Railroad Company. In point of fact, therefore, is there any such corporation as the National Railway Company? The Attleboro Railroad Company is no more a corporation of the County of Bucks than of the County of Philadelphia or Montgomery; it is a corporation of and within the State of Pennsylvania. Under these circumstances what is a bond of the National Railway Company, secured by its mortgage, worth, or any other contract entered into under that name? This would be a pertinent inquiry for the trustees to make. The mortgage also covers the road property, branches and franchises of the Stanhope Railroad Company of New Jersey. The National Railway Company have leased the road, property, branches and franchises of this New Jersey corporation, which not only has no road, but whose charter, it is alleged, was fraudulently obtained. This fraud will be the subject of legislative investigation and probable repeal. That the railway company, as a Pennsylvania corporation, has no authority to enter into such lease and contract with the Stanhope Company is fully decided in the recent case of Wood vs. the Bedford & Bridgeport Railroad Company, in which it is held that the acts of 1861 and 1870 empower the leasing of completed railroads only, and will not authorize the transfer of the franchise of building a railroad. If, therefore, the National Railway Company cannot lease an uncompleted road, nor take the transfer of the franchise for building a railroad within or without the State under the Pennsylvania acts of 1861 and 1870, it certainly cannot obtain that power from anything in the charter of the Stanhope Company. Nor is it comprehensible, even if full power existed for such a lease, by what process a lessee of a railroad and its franchise can mortgage the road and franchises of the lessor specifically, as is done by the National Railway Company. It may mortgage the lease, as such, and as a piece of personal property, but it can give no greater estate than it actually has in the thing mortgaged. By the mortgage, 20 per cent. of the outstanding bonds can require the trustee to sell the road in the event of failure to pay interest or principal for ninety days, while the same instrument requires that no suit at law or in equity shall be brought upon any bond or for the interest thereon, thus effectually restraining any bondholder from proceeding for the recovery of the same out of the mortgaged premises otherwise than at the suit of the Union Trust Company as mortgagees in trust. This last is a most unusual clause in a corporation mortgage, and would seem to put those holding 19 per cent. of such securities entirely at the mercy of a stronger party, requiring them to submit to any terms of compromise or sale which might be dictated to them. We call attention to this matter for the purpose of cautioning corporations in credit against the impropriety of assuming trusteeships for borrowing companies without first thoroughly examining the 'title papers' to see that all is legal and right, as well as to awaken the attention of our readers to the danger of investing in loans for which there may be no sufficient provision in law for recovery of interest or principal. In buying houses and lands great care is observed to see that the title is good; no less care should be observed when investing in new company loans."

A telegram from Philadelphia, dated August 12, says: "In the Nisi Prius Court to-day, application was made for an injunction in the case of William Sellers & Co. against The National Railway Company, to restrain the latter from collecting instalments upon subscriptions, from issuing bonds, and from constructing their road. The defense will be ready to proceed, the matter was postponed until next Saturday."

St. Paul & Pacific.

The Winona (Minn.) *Republican* says that advices have been received to the effect that the board of directors of the Northern Pacific Company have resolved to complete the branch from Sauk Rapids to Brainerd at once.

Little Rock, Pine Bluff & New Orleans.

The Little Rock *Republican* says that the track is laid from the southern terminus at or near Eunice (now called Chicot City, we believe,) on the Mississippi, northward 36 miles past Watson Station (opposite and south of Red Fork), and nearly to Dixon Bayou. The route from Watson is northwest, a few miles south of the Arkansas most of the way, to a point in the northeast corner of Grant County 25 miles due south of Little Rock—thence northward. About 18 miles of the track has been laid the current year.

Utah Northern.

This road is now in operation for 22 miles north of its connection with the Central Pacific, and grading is nearly completed for ten miles more.

Utah Southern.

Considerable work has been done on the grading of this road this season, but little or no track laid. It is in operation for 17 miles south of Salt Lake City.

Later news (a telegram dated the 9th) announces that rails have been laid to Point Mountain, 25 miles from Salt Lake City.

American Fork Railroad.

The grading for this Utah railroad, which will be about 17 miles long, is nearly completed, some track is down, and considerable iron is arriving.

Mississippi Valley.

This company is reported to have filed with the Secretary of State of Missouri the necessary papers for the extension of the road to a junction with the "Clarksville, Louisiana & Western."

Quincy & Des Moines.

This company was organized by the election of officers at a meeting held at West Quincy, Mo., August 6. The company is organized under the laws of Missouri, and intends to build a railroad from Des Moines, Iowa, south to the State line, in the direction of Kirksville, Chanton and Indianola being points on the line. The officers are: President, Major J. G. Rowland; Treasurer, U. S. Penfield; Secretary, Joseph B. Gilpin; Directors, Charles A. Savage, Thos. Jasper, Hugh Smith, Joseph G. Rowland, Charles H. Bull.

Lawrence & Topeka.

Nineteen miles of this road is graded, and tracklaying was to begin August 10.

Kansas City, St. Joseph & Council Bluffs.

The St. Joseph *Gazette* says that the contract for the construction of the branch of this road from Amazonia (on the main line, 10 miles above St. Joseph) north by east, to Savannah (on the Marysville Branch), has been let to Messrs. V. W. Parker and E. S. Wills, of Atchison. The length of this line is about five miles, and it completes a loop from Savannah to St. Joseph.

Shenandoah Valley.

The differences between this company and the Central Improvement Company are reported to have been adjusted, and work is to be prosecuted vigorously. The engineers are locating the line from Shepherdstown through Sharpsburg to Hagerstown, Md. Three-quarters of a mile of grading has been completed near Charlestown, and a large force is now at work.

Buffalo & Jamestown.

The contract for the construction of this road has been let. Bids were received from Isaac Holloway, of Buffalo, Russell & Moulton, of Grand Rapids, Mich., Miller & Decker and others. The successful bidders were Messrs. Russell & Moulton, who are to receive \$33,000 per mile, taking their pay in cash, city and town bonds and bonds of the company. The road is to be substantially built, with iron bridges and culverts of masonry, and is to be finished by January 1, 1873. There is considerable heavy work on the road, as, indeed, the high price indicates.

West Jersey.

The business of this road has largely increased the present season. The new communication system has produced a large increase of passenger travel, which has made a considerable increase in the rolling stock necessary. A large part of the road has been relaid with steel rails.

Atlantic & Gulf.

The Macon *Telegraph* has been furnished with a report of the Georgia State Commissioners appointed to represent the million dollars of stock held by the State in the Atlantic & Gulf Railroad Company. The committee make a strong argument in favor of carrying out the original design of this road, and placing it in connection with the Gulf at Pensacola, Mobile and New Orleans, which can now be done by the construction of 165 miles of railroad from Bainbridge to Pollard, in Alabama, where it will connect with finished lines of railroad to all these places. They say that such is the poverty of the soil which this road traverses, that its local traffic can never return the investment. The whole taxable property of the region—leaving out Chatham and Doughty counties—does not exceed fifteen millions, and the whole amount of cotton derived from 150 miles of the distance, in 1871, was only 2,236 bales. They say if the gap between Bainbridge and Pollard was filled up, they would have connection between Savannah and Mobile in a distance of 476 miles, and to New Orleans in 616 miles—while the distance via Macon and Montgomery would be 705 miles. The Commissioners do not propose any specific measure to the Legislature.

Only about 25 miles of such an extension would be in Georgia, and the rest either in Florida or Alabama, or both, Pollard being only about four miles north of the Florida line. The country on this proposed extension may be somewhat better than on the completed part of the road; but still it is poor and very thinly settled; and as for through traffic, it would have to compete with other lines, and as it would be to the interest of the roads to Pollard to carry to other lines, it is very doubtful whether the through traffic would justify the extension, especially if the Jacksonville, Pensacola & Mobile road, whose route is about 25 miles further south, shall be completed. The average wealth of the five Alabama counties through which such an extension would probably be made is only one-third of the average for the State.

Union Pacific.

This company having to apply one-half of the earnings from Government traffic to the payment of the interest of the bonds guaranteed by the Government, the question has arisen whether this is applicable to the receipts from transportation over the Missouri River Bridge, for which separate charges are made. The question was submitted to the Secretary of War, who referred it to the Quartermaster General, who referred it to the Second Comptroller of the Treasury, who decided "that one-half of the tolls due the Union Pacific Railroad Company for the use of the bridge should be deducted and withheld," and the Quartermaster General has ordered that this interpretation be followed in making up the accounts with the company.

Colebrookdale.

This branch of the Reading road is to be extended from Mount Pleasant (13 miles north of Pottstown), the present terminus, to Siesholtville, about 8 miles. The route is now being surveyed. The Philadelphia & Reading Company have purchased a half interest in the ore bank at Siesholtville.

Vermont Central.

A correspondent of the Springfield *Republican*, writing from St. Albans, Vt., says:

"The Vermont Central Railroad combination has become something enormous, and its ramifications extend through States and communities that had little thought, five years ago, of becoming so connected with a short line of mortgaged Vermont road. It now controls nearly every railroad in Vermont and is a powerful element in State politics; it leases roads in New York, New Hampshire, Massachusetts and, I believe, Canada, and is felt every year in the legislation of those States. It has built up an immense business, some of which is profitable and some is not, and the question is whether it can so distribute its profits as to make the whole enterprise succeed and hold together. It is enriching the individuals most concerned in its management, and is supplying the general public with traveling and freight facilities much better than they had before. But many Vermont people complain that it does not accommodate them, that it is grasping and intolerant in its dealings and as selfish as any of the railroad rings now in existence. It is closely linked with the Northern Pacific Railroad enterprise, and will derive great benefit from the prospective success of that. Much of the business and growth of St. Albans depends upon the present managers of the Vermont Central combination—they live there, and shape, to a great extent, the industry of the town. They are now building a great rolling-mill, which will employ from 500 to 1,000 hands, and which has a capital of \$400,000; of this \$210,000 is owned in St. Albans, and a large part of the rest by the gun-making Remingtons. The railroads composing this combination are to be the buyers of the iron and steel furnished by this rolling-mill, and the profits of it will go largely to the managers of the roads."

Marietta & Pittsburgh.

This company filed, August 7, with the Secretary of State of Ohio, the necessary papers to enable it to construct branches to the main line, described as follows: Northwest Extension, from a point on the main line in Liberty township, Guernsey County, through Guernsey, Coshocton, Holmes, Knox, Ashland and Richland counties, to a connection with the Mansfield, Coldwater & Lake Michigan road, at Mansfield; the McConnellsville Branch, from a point on the main line near Point Pleasant, Valley township, Guernsey County, through Guernsey, Noble, Muskingum and Morgan counties, to a connection with the Marietta & Muskingum Valley road, at McConnellsville; East Fork Branch, from a point on the main line in Salem township, Washington County, to a point on the east line of Noble County, near Hafford township, Monroe County; Dexter Coal Branch, from a point near Dexter Station, Jefferson township, Noble County, up Buffalo Run; Marietta City Branch, from a point in Washington township, Washington County, through the city of Marietta to a connection with the Marietta & Cincinnati road in Harmar township.

Wells River.

The Springfield *Republican* says: "The completion of the Wells River Railroad is promised by November 1. The project of a railroad straight north through the heart of the State is very popular in itself, but people are very suspicious of its chief supporters, among whom are James R. Langdon and George Shepard, men of great wealth and influence, who disgusted the people of the town by eluding the payment of their subscription to the road now building."

Hoosac Tunnel.

The progress of the Hoosac Tunnel in July was as follows: At the east end, 129 feet; west end, 145 feet; central shaft, 109 feet. Total length opened to August 1—East end, 10,685 feet; central shaft, east, 1,019 feet; west, 339 feet; length remaining to be opened—East end, 1,133 feet; between the west end and the central shaft, 3,792 feet; total, 4,925 feet.

Athol & Enfield.

From the report presented at the annual meeting, held August 6, we find that the receipts from October 1, 1871, to July 1, 1872, ten months, were as follows: From freights, \$15,607; passengers, \$9,416; express, \$723; mail, \$1,312; total for ten months, \$27,058. In the same time the expenditures reached \$22,699, leaving the net earnings of the ten months \$4,359, not enough by \$12,442 to pay the interest on the bonds of the road during that time. The capital stock was reported to be \$700,000. The road is doing a small business, but the directors expect greatly increased receipts as soon as the connection with Springfield is made.

Quincy, Missouri & Pacific.

This company has recently received eight or ten car-loads of spire-bolts, etc., and last week was taking up the road about eight car-loads of iron daily, and 45 car-loads were sent across the Quincy bridge to the road August 6. The track is to be laid to Kirksville, Mo., 25 miles west of the recent terminus at Edina, by the 1st of September. If sufficient material is received, work will be prosecuted from the western as well as the eastern end. A new locomotive was received last week.

Connecticut River.

This road is now supplying all its local trains with the Westinghouse brake. The Vermont Central is about to adopt this brake also, but the through trains of the Connecticut River road cannot be supplied with the brake until the Passumpsic River road also adopts it, as the cars of those Vermont roads all run over the Connecticut River road to Springfield.

Union Pacific Land Sales.

The sales of the Land Department of the company for the month of July, 1872, were 40,389 30-100 acres, amounting to \$133,897.03, at an average of \$4.41 per acre. The total sales from July 28, 1869, to the present date are, 601,559 6-100 acres, amounting to \$2,533,367.58, at an average of \$4.21 per acre. This is something less than a thousand square miles—enough to make a large county of 25 ordinary townships.

Manchester & Keene.

A meeting of the directors of this road was held at Keene, N. H., August 6, at which steps were taken for the early survey, location and construction of this road. The offices of the road will be established at Keene, and the books for subscription to the capital stock opened at once. The road will be operated by the Boston & Lowell and Nashua & Lowell railroads on terms which guarantee six per cent. upon the capital stock.

Boston, Nashua & Acton.

The contractors have begun work on the Nashua section of this road.

Michigan Lake Shore.

The iron is now being laid between Monteith, Allegan County, Michigan, and Mansfield, Ohio, and the cars, it is said, will be running in the fall.

Niobrarah & Northern Nebraska.

Work on this road has been suspended, partly on account of the increase in the price of iron.

Chesapeake & Ohio.

The engine house of this company, at Staunton, Va., was destroyed by fire on the morning of July 31. The building was of wood and contained five new locomotives, which were partially destroyed. The loss was estimated at \$20,000.

Rio Grande Railroad.

This road, which is to run from Brown Santiago to Brownsville, Texas, about 30 miles, has the grading all complete and six miles of track laid. The ties are all on hand and the track will shortly be ready for travel. This is in the extreme southern point of Texas.

Toledo & Southwestern.

The survey of this road was commenced July 31 by Chief Engineer O. Howard. The Commissioners of Lucas County have advertised for proposals for constructing the road through that county. The present survey is for the final location, and the contractors are to begin in 30 days.

Chicago, Dubuque & Minnesota.

Trains are now running on this road as far north as Albin, 93 miles from Dubuque, and 11 miles north of the recent terminus at Lansing. To complete it to La Crosse, 24 miles of track must be laid, which is to be done by September. The new line of the Milwaukee & St. Paul from La Crosse to Winona will complete the river line to St. Paul, by which the distance from Dubuque to St. Paul will be 247 miles, from Clinton to St. Paul 307 miles (all on the river bank), and from Chicago to St. Paul, by way of Dubuque, 435 miles, the distance by way of Milwaukee being 409 miles. The Milwaukee & St. Paul, however, will probably not encourage a business by way of Dubuque.

Wisconsin Central.

The contracts now made by this company with different parties call for the completion of 15 miles by September 1; 20 miles more by September 15; 20 miles by November 15; 20 miles by December 1; 20 miles by June 1, 1873, and 20 by October 1, 1873, which will give the company 205 miles of road from Menasha to Ashland.

Alabama & Chattanooga.

The Madison (Ala.) *Gazette* says that it is reported that negotiations are in progress for the sale of this road by the State of Alabama to a company of English capitalists, who wish to use the road as an outlet to large tracts of coal and mineral land, which they are about to buy.

Gulf, West Texas & Pacific.

This road extends from Indianola, on the Gulf of Mexico, to San Antonio, where it will connect with the International road. The length of the road, when completed, will be 113 miles, of which 38 miles were complete at the commencement of this year, and 30 miles more are under contract to be completed in November next. A branch from Cuero to Austin, 85 miles, is projected. The road passes through a very fertile section of country.

Painesville, Warren & Pittsburgh.

A correspondent of the Cleveland *Herald* says that the surveys of this proposed road are complete, and gives the following account of the line:

"The survey, as made, shows the distance from the dock line at Fourth street, in Fairport, to the Ashtabula, Youngstown & Pittsburgh track, in Ashtabula, to be 23 miles and 1,150 feet. The summit, three miles west of Ashtabula, is 278 feet above the lake. The maximum grade is less than 40 feet per mile, and can be reduced to 33 feet at a moderate cost. The curves are as follows: At R. M. Johnson's farm, 9½ deg.; at Perry Station, 14½ deg.; at Madison Station, 19 deg., and at a point three miles east of Madison, 5½ deg. Another line, to be surveyed hereafter, will reduce the distance to less than 22 miles, and avoid the two curves at Perry and three miles east of Madison."

Chicago, Clinton & Dubuque.

Engineers are surveying a route for the proposed extension of the road from Dubuque to Burlington. The surveying party has reached Davenport.

Chicago, Dubuque & Minnesota.

A party of engineers are surveying a line for a branch road to run from the junction of this road with the Iowa Pacific in Fayette County, through New Hampton, Chickasaw County, to Mankato and New Ulm, in Minnesota.

St. Paul & Sioux City.

A surveying party has begun to survey a line from Crystal Lake, 12 miles above Mankato, south to the State line. The line will probably run through Blue Earth City. It is reported that this is preliminary to the building of a branch road in the direction stated.

Sioux City & St. Paul.

Ground has been broken and work commenced on the new machine shops at Sioux City. Mr. Joseph Wall, of Sioux City, is contractor for the stone and brick work.

Lake Superior Steamers.

A recent letter from Sault Ste. Marie to the Pittsburgh *Commercial* contains the following:

"Two years ago the steam fleet of Lake Superior was about as follows:

Steamers running from Buffalo	3
Steamers running from Cleveland and Detroit	4
Steamers running from Chicago	4
Steamers running from Canada	2
Total	11

"This year it is as follows:

From Buffalo and Erie	11
From Cleveland	4
From Chicago	4
From Canada	6
Steam barges	6
Total	31

"While this shows a large increase of steamers connected with the Lake Superior fleet, the increase in tonnage is still larger, inasmuch as there have been steamers added whose carrying capacity is much larger than those of two years ago. But largely as steamers have increased, the addition of sailing vessels is considerably in advance, as far as tonnage is concerned, and it may be safely stated that the tonnage of vessels engaged in the Lake Superior trade has increased 200 per cent. in two years. The increase is caused by the large demand for the iron ores of Lake Superior, the completion of the railroad from Duluth to St. Paul, the discovery of silver on the North Shore, and the work on the Northern Pacific Railroad."

Chicago, Dubuque & Minnesota.

A thousand tons of iron for this road—enough for about 11 miles of track—arrived August 5.

Davenport & St. Paul.

The track was laid as far as Hopkinton, Iowa, August 5. Hopkinton is ten miles north of the recent terminus at Monticello, and eighty miles northwest of Davenport. With the branch from Eldridge to Maquoketa, the company now has 112 miles of road in operation.

A party of the officers of the Indianapolis, Bloomington & Western road passed over this road, August 7, going up the road to Hopkinton and also over the branch to Maquoketa. The object of the trip was to inspect the road previous to accepting it, and to select a site for the repair shops.

Utah Mining Railroad.

There is talk of constructing a branch of the Utah Southern over a very difficult country to the Emma and other mines. It would be about 15 miles long, and have nearly a uniform gradient of 240 feet to the mile, with many very sharp curves.



SATURDAY, AUGUST 31, 1872.

Contributions.

PRACTICAL FIELD ENGINEERING.

NUMBER III.

SETTING OUT TRESTLES ON CURVES.

The following is the best practical method of setting out the ground line of trestle bents where the trestle is on a curve:

Say your bents are to be 12½ feet apart. Run in your curve by either of the methods already explained, and, beginning at a point in your curve 6½ feet from the point in which you wish to erect the first bent, establish a number of chords equal to the number of bents contained in your trestle, each chord intercepting an arc of your circle 12½ feet long. At the middle point of each of these chords set out a line at right angles with the chord. The point where this last line cuts your curve is the middle of the base of your bent, which base must follow the direction of the line. That is, each bent will be in the direction of a radius of the curve, as it should be.

The above method will also apply to setting out culverts, cattle guards, pass-ways, etc., when they are on a curve.

COMPOUND AND REVERSE CURVES.

Compound curves may be located by the following very simple method: Say you have a curve to locate through an angle of 20 degrees, and beginning at the proper P. C. you have located a 1-deg. curve for a distance of ten stations. This, of course, exhausts just one-half of your angle. Now if you desire to compound your curve with a 2-deg. curve at this point, you have only to set your transit accurately over the last station of your 1-deg. curve and turn into tangent, which makes you ready to begin your deflections for the new curve, which, of course, will in this case run through ten degrees, or five stations, terminating at the proper P. T.

In a reverse curve, the P. T. of your first curve is the P. C. of your second one; and you have only to begin at this point, after having run in your first curve, and trace the second curve in a direction reverse to that of the first, terminating at the proper P. T.

Trestle bents are located and set out on compound and reverse curves, just as in the case of simple curves.

Note 1. To find the degree of curvature, divide 5,730 by the radius in feet.

Note 2. To find the length of your curve, divide your angle of deflection by the degree of curvature: result will be the length in feet.

Note 3. To find the middle ordinate to any chord for any degree of curvature: From the square of the radius subtract the square of half your chord, extract the square root of remainder, and subtract this root from radius: result will be the middle ordinate.

A second method for finding the middle ordinate is to subtract the natural cosine of half the degree of curvature from 1 and multiply remainder by radius of curvature.

But the simplest rule is to multiply the ordinates of a 1-deg. curve by the deflection angle of the curve whose ordinates are required. This is general and applies to any ordinate; but in order to use it we must first know how to find any ordinate of a 1-deg. curve, the middle ordinate being given. Therefore I give the following rule:

To find the length of any ordinate of a curve: 1st. From the middle ordinate of the given chord subtract the middle ordinate of a chord measured by twice the distance between the ordinates; result will be the length of the first ordinate on either side of the middle ordinate. 2d. To find the second ordinate on either side of the middle one, you must double the length of your second chord and so on, adding twice the distance between the ordinates to the length of the second chord, third chord, etc., according to the position of the required ordinate.

To make this important rule plain without the use of a diagram, let us say it is required to find the length of an ordinate to be drawn fifty feet distant from the middle ordinate of a 1,000 foot chord, and say the length of this middle ordinate is found to be 100 feet. Now double the distance between the ordinates is 100 feet. Calculate the middle ordinate of a chord of 100 feet, and subtract it from the given middle ordinate. Result will be the required ordinate.

It will readily be seen to what use this rule may be put by the engineer in superintending the finishing up of earthwork and trestlework on curves, and it is invaluable for curving rails in track laying.*

* The suggestions of "J. J. D." in the GAZETTE of August 17, will receive attention.

The next paper of this series will contain the best methods of railroad leveling. HOOSIER.

Boiler Incrustations and Water Supply.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your paper of August 10 I notice an article entitled "The Master Mechanics' Association—Next Year." In enumerating the subjects to be considered at the meeting next year you name "The Operation and Management of Locomotive Boilers, including the Purification of Water." You say, "few who have not had some experience in the West can realize the extent of the evil of impure water; and the loss in fuel from this cause is annually very great. As yet no effectual remedy has been proposed, and hardly any mitigation of the evil."

"The great surprise is, that it has not attracted more atten-

tion from chemists and others engaged in kindred occupations. * * * Judging from past experience, we are not hopeful that such a remedy will be found, unless the inquiries of those who investigate the subject take an entirely new direction."

I do not lay claim to much knowledge of chemistry, or to being a scientist, but in many years of railroading I have realized the "extent of the evil of impure water." I heard a master machinist, in charge of the motive power on an important railroad in Illinois, assert that it cost his company \$2,000 per annum for each locomotive in use for impure water above what it would cost if pure water were used. And he offers such proof as convinces one of the probable truth of his statement.

The item of fuel is not the only one to be considered in connection with this subject. It is not a small matter that the locomotive must go to the shop every few months and be out of service for a time while the flues are taken out and cleaned, and the inside of the boiler cleaned of mud, etc. There is something startling in the thought that a railroad with a hundred locomotives is wasting two hundred thousand dollars per annum in consequence of using impure water for its locomotive boilers.

If any stockholder thinks the picture overdrawn, let him watch the experiment; say, take a locomotive fresh and clean from the shop, test the amount of fuel used in hauling a train a given number of miles, and then after that locomotive has been in use six months make another test with, as near as may be, the same conditions. He will find such a difference as will surprise him, if he has not previously given the matter a test. So far as I know, the experiments heretofore tried in seeking to overcome the difficulty, have been in the boiler, leaving the lime and other impurities where they are not wanted. Is it not possible to purify the water before it enters the boiler? Perhaps it can be done by raising the water in the tank—water station—to the boiling point. Will not ebullition cause the lime to "seek its level" at the bottom of the tank? But I think the cost of raising the temperature sufficiently for this purpose will discourage any one from seeking a remedy in this direction. Where then is the remedy? Why use impure water at all?

Is there a railroad in the country that cannot get a full supply of pure, soft water at far less cost than \$2,000 per annum for each locomotive? Is it not feasible for any railroad company to impound and save the soft water that falls from the clouds? Are there not on all the railroads, at suitable distance from each other, depressions where, by scraping off the soil and making dams and embankments, sufficient water can be stored for use through the driest season? I think it has been demonstrated that in New England the evaporation amounts to about 27 inches per annum. In Illinois and Missouri it may be 36 inches. But we never have 12 successive months without sufficient fall of rain to fill these reservoirs—generally not more than two or three months at a time. There are portions of the West where it is difficult to get a sufficient supply of water for a railroad from wells. Twice in the past five years some of the railroads in Illinois have been for weeks at a time crippled for lack of water. Is it not strange, that instead of spending thousands of dollars for prospecting for water veins under the surface, and other thousands in digging wells containing a scanty supply of hard, lime water, managers of railroads do not try to save some of the soft water a bountiful Benefactor provides for their use? M.

Conscience Money.

C., B. & Q. R. R. Co., CHICAGO, August 21, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The "original" of which the inclosed is a copy came to me inclosing the sum of \$1.20 "conscience money."

Assuming there may be others in the condition of our unknown friend, who may only need the force of a wholesome example that they may do likewise, I am led to send you the bit of "heaven" that you may place it before your readers if you choose, and allow it to do its "good work."

Yours truly,

SAM'L POWELL, G. T. A.

[COPY.]

—, Ill., August 17, 1872.

"MR. SAM'L POWELL:

"DEAR SIR: Some 13 or 14 years ago I obtained a ride upon the C., B. & Q. cars under wrong pretenses, and it has been anything but a source of comfort to me ever since.

"I know that the C., B. & Q. R. R. Co. is wealthy, and I am poor, or at least not worth much, but that does not justify me in doing wrong.

"If I recollect right, the fare at that time was 65 cents, the interest on it 14 years at 6 per cent. would be in the vicinity of \$1.20. I have rode several times on your road without paying, but not fraudulently.

Yours respectfully,

"P. O. Box —."

A Formula for Frogs.

TUNKHANNOCK, Pa., August 23, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your number of August 10 I notice a paper signed by "L." who wishes a formula for finding the distance from the point of frog to the head-block.

As simple a formula as I can give for that purpose, which, although not theoretically correct, differs from the truth but very little, would be as follows:

Let l = the distance required in length of the frog for one foot spread;

g = gauge of track;

d = throw of switch.

As in a previous paper,

$D + s = 2gl$; but,

$s = 2l\sqrt{gd}$; whence $D = 2l(g - \sqrt{gd})$.

A mathematically exact formula would require five times the calculation, and will not give results to differ from those found by the preceding, in any case that I have ever had occasion to try, by one-half of an inch.

Because I do not enter into mathematical niceties here, I hope none of your readers will class me among the despisers of formulae, for I consider nothing can be easier to use, nor more ready when desired. I fear that without the experience of some mathematical engineers who changed some correct rules to approximations for those deficient in the veriest rudiments of the business, there would be very few of them to be found. T.

The Narrow Gauge—Mr. Evans' Questions.

No. 115 BROADWAY, NEW YORK, August 12, 1872.

TO THE EDITOR OF THE RAILROAD GAZETTE.

In your issue of the 10th inst. you published an extract of an article from the pen of Mr. W. W. Evans, civil engineer, in which he advocates broad-gauge railroads. I read the extract with pleasure, because the weakness of the arguments advanced by Mr. Evans against the narrow-gauge system, which I prefer, is a further proof of the soundness of this system.

As I am on the eve of leaving the country, I am unable to devote the time which the answers to the forty-eight questions suggested by Mr. Evans would require, but I will state my opinion on some of them.

On the subject of embankments, Mr. Evans says:

"10th. In embankments, is there any good reason why they should be any wider for standard gauge than narrow gauge, beyond a vertical, longitudinal slice placed in the center 14½ in. width, the difference between 3ft. 6in. and 4ft. 8½ in. This in an embankment 50 feet high makes 1½ per cent. difference in quantity and cost, but only for so much as is 50 feet high.

"11th. Where the line is a surface line, or very nearly so, will there be any difference in the cost of foundation between the narrow and standard gauges?"

Which means:

1st. That Mr. Evans fixes at only 14½ in. the width of the longitudinal section which has to be deducted from the central prism of every embankment.

2d. That Mr. Evans fixes at 0 and 50 feet the altitudes which are to serve as limits of comparison.

3d. That only in embankments 50 feet high is there a difference of 1½ per cent.

4th. He asserts that when the altitudes are only a little above zero, there is no difference.

I will examine each of these deductions in detail.

1st. In order that the section to be deducted should be only 14½ in. wide, as Mr. Evans asserts, it would be necessary that a ten-foot road-bed being the accepted width of the embankments of a narrow-gauge road (as claimed alike by partisans and opponents), the broad gauge should have a road-bed of 11ft. 2½ in., which is not correct. The narrowest road-bed of embankments of broad-gauge roads is 14ft., and in confirmation of this fact I can cite the following authorities: Rankine, Voss, Gillespie, Reynault, Perdonet and Clandet. Consequently the width of the section to be submitted would be the difference between the width of the narrow-gauge road-bed and fourteen feet, that of the broad-gauge road-bed, or four feet.

Secondly, I hardly know how to account for the fact that Mr. Evans quotes the very instances which occur most rarely in the construction of railroads. Perfectly level superfloors are scarcely ever met with, and embankments 50 feet high occur very rarely, or for any distance; these instances can be classed as exceptional. Let Mr. Evans glance over the many roads in Peru which he quotes; let him read the reports of Mr. Young-husband and Mr. Thorndike on the railroads from Mollendo to Arequipa, and from Arequipa to Puno; let him examine the elevations of the railroads from Chimboto to Huaraz, from Puno to Cuzco, and from Huacho to Sayan, and he will find proofs of what I assert. The railroad from Arequipa to Puno, for instance, is 357 kilo. long, and in this distance the movement of earth is 7,770,330 cubic metres, and as the road-bed is 4.30 meters, the average elevation would be 2.635 meters, equal to 8½ English feet.

If we examine the railroads of this country, and take, as an example, the Pacific Railroad, we find that only in the transit across the Rocky Mountains and across the Sierra Nevada are there works of such a magnitude—that is to say, over an extent of some 300 miles; while in the remaining 1,300 miles of the road the embankments do not exceed 4, 5, 6 and 7 feet in height. This can be verified by an examination of the official report of the Secretary of War, to which are appended the enlightened reports of General McClellan.

The Baltimore & Ohio road affords another example. This road has unquestionably been, if not the most difficult, one of the most difficult, to build in the United States. Nevertheless the movement of earth on it was 16.78 cubic yards for every lineal yard, and as its road-bed is 26 feet wide, its average elevation is 4.44 feet. Only in the thirteen first miles were there any works of magnitude, such as the cutting near Baltimore, 70 feet high, and the embankment across Gadsby's Run, 57 feet high. The grading of the thirteen first miles cost \$3,994.1—more than that of the remaining 54½ miles.

Passing from the United States to England, we find that at the end of 1848 there were in the latter country 5,000 miles of railroads, which had required an earth movement of 250,000,000 of cubic yards, equal to an average elevation of 7.64 feet.

That is to say, in Peru we have an average elevation of 8.613 feet, in this country 4.44 feet, and in England 7.64 feet. The average of these three is 6.90 feet, a figure very far from the one selected by Mr. Evans for the groundwork of his arguments.

If my object were to adduce arguments in favor of the narrow gauge irrespective of complete soundness, I should avail

Little Rock, Pine Bluff & New Orleans.

The Little Rock *Republican* says that the track is laid from the southern terminus at or near Eunice (now called Chicot City, we believe,) on the Mississippi, northward 36 miles past Watson Station (opposite and south of Red Fork), and nearly to Dixon Bayou. The route from Watson is northwest, a few miles south of the Arkansas most of the way, to a point in the northeast corner of Grant County 25 miles due south of Little Rock—thence northward. About 18 miles of the track has been laid the current year.

Utah Northern.

This road is now in operation for 22 miles north of its connection with the Central Pacific, and grading is nearly completed for ten miles more.

Utah Southern.

Considerable work has been done on the grading of this road this season, but little or no track laid. It is in operation for 17 miles south of Salt Lake City.

Later news (a telegram dated the 9th) announces that rails have been laid to Point Mountain, 25 miles from Salt Lake City.

American Fork Railroad.

The grading for this Utah railroad, which will be about 17 miles long, is nearly completed, some track is down, and considerable iron is arriving.

Mississippi Valley.

This company is reported to have filed with the Secretary of State of Missouri the necessary papers for the extension of the road to a junction with the "Clarksville, Louisiana & Western."

Quincy & Des Moines.

This company was organized by the election of officers at a meeting held at West Quincy, Mo., August 6. The company is organized under the laws of Missouri, and intends to build a railroad from Des Moines, Iowa, south to the State line, in the direction of Kirksville, Chanton and Indianola being points on the line. The officers are: President, Major J. G. Rowland; Treasurer, U. S. Penfield; Secretary, Joseph B. Gilpin; Directors, Charles A. Savage, Thos. Jasper, Hugh Smith, Joseph G. Rowland, Charles H. Bull.

Lawrence & Topeka.

Nineteen miles of this road is graded, and tracklaying was to begin August 10.

Kansas City, St. Joseph & Council Bluffs.

The St. Joseph *Gazette* says that the contract for the construction of the branch of this road from Amazonia (on the main line, 10 miles above St. Joseph) north by east, to Savannah (on the Marysville Branch), has been let to Messrs. V. W. Parker and E. S. Wills, of Atchison. The length of this line is about five miles, and it completes a loop from Savannah to St. Joseph.

Shenandoah Valley.

The differences between this company and the Central Improvement Company are reported to have been adjusted, and work is to be prosecuted vigorously. The engineers are locating the line from Shepherdstown through Sharpsburg to Hagerstown, Md. Three-quarters of a mile of grading has been completed near Charlestown, and a large force is now at work.

Buffalo & Jamestown.

The contract for the construction of this road has been let. Bids were received from Isaac Holloway, of Buffalo, Russell & Moulton, of Grand Rapids, Mich., Miller & Decker and others. The successful bidders were Messrs. Russell & Moulton, who are to receive \$33,000 per mile, taking their pay in cash, city and town bonds and bonds of the company. The road is to be substantially built, with iron bridges and culverts of masonry, and is to be finished by January 1, 1873. There is considerable heavy work on the road, as, indeed, the high price indicates.

West Jersey.

The business of this road has largely increased the present season. The new communication system has produced a large increase of passenger travel, which has made a considerable increase in the rolling stock necessary. A large part of the road has been relaid with steel rails.

Atlantic & Gulf.

The Macon *Telegraph* has been furnished with a report of the Georgia State Commissioners appointed to represent the million dollars of stock held by the State in the Atlantic & Gulf Railroad Company. The committee make a strong argument in favor of carrying out the original design of this road, and placing it in connection with the Gulf at Pensacola, Mobile and New Orleans, which can now be done by the construction of 165 miles of railroad from Bainbridge to Pollard, in Alabama, where it will connect with finished lines of railroad to all these places. They say that such is the poverty of the soil which this road traverses, that its local traffic can never return the investment. The whole taxable property of the region—leaving out Chatham and Dougherty counties—does not exceed fifteen millions, and the whole amount of cotton derived from 150 miles of the distance, in 1871, was only 2,236 bales. They say if the gap between Bainbridge and Pollard was filled up, they would have connection between Savannah and Mobile in a distance of 476 miles, and to New Orleans in 616 miles—while the distance via Macon and Montgomery would be 705 miles. The Commissioners do not propose any specific measure to the Legislature.

Only about 25 miles of such an extension would be in Georgia, and the rest either in Florida or Alabama, or both, Pollard being only about four miles north of the Florida line. The country on this proposed extension may be somewhat better than on the completed part of the road; but still it is poor and very thinly settled; and as for through traffic, it would have to compete with other lines, and as it would be to the interest of the roads to Pollard to carry to other lines, it is very doubtful whether the through traffic would justify the extension, especially if the Jacksonville, Pensacola & Mobile road, whose route is about 25 miles further south, shall be completed. The average wealth of the five Alabama counties through which such an extension would probably be made is only one-third of the average for the State.

Union Pacific.

This company having to apply one-half of the earnings from Government traffic to the payment of the interest of the bonds guaranteed by the Government, the question has arisen whether this is applicable to the receipts from transportation over the Missouri River Bridge, for which separate charges are made. The question was submitted to the Secretary of War, who referred it to the Quartermaster General, who referred it to the Second Comptroller of the Treasury, who decided "that one-half of the tolls due the Union Pacific Railroad Company for the use of the bridge should be deducted and withheld," and the Quartermaster General has ordered that this interpretation be followed in making up the accounts with the company.

Colebrookdale.

This branch of the Reading road is to be extended from Mount Pleasant (13 miles north of Pottstown), the present terminus, to Siesholtville, about 8 miles. The route is now being surveyed. The Philadelphia & Reading Company have purchased a half interest in the ore bank at Siesholtville.

Vermont Central.

A correspondent of the Springfield *Republican*, writing from St. Albans, Vt., says:

"The Vermont Central Railroad combination has become something enormous, and its ramifications extend through States and communities that had little thought, five years ago, of becoming so connected with a short line of mortgaged Vermont road. It now controls nearly every railroad in Vermont and is a powerful element in State politics; it leases roads in New York, New Hampshire, Massachusetts and, I believe, Canada, and is felt every year in the legislation of those States. It has built up an immense business, some of which is profitable and some is not, and the question is whether it can so distribute its profits as to make the whole enterprise succeed and hold together. It is enriching the individuals most concerned in its management, and is supplying the general public with traveling and freight facilities much better than they had before. But many Vermont people complain that it does not accommodate them, that it is grasping and intolerant in its dealings and as selfish as any of the railroad rings now in existence. It is closely linked with the Northern Pacific Railroad enterprise, and will derive great benefit from the prospective success of that. Much of the business and growth of St. Albans depends upon the present managers of the Vermont Central combination—they live there, and shape, to a great extent, the industry of the town. They are now building a great rolling-mill, which will employ from 500 to 1,000 hands, and which has a capital of \$400,000; of this \$210,000 is owned in St. Albans, and a large part of the road by the gun-making Remingtons. The railroads composing this combination are to be the buyers of the iron and steel furnished by this rolling-mill, and the profits of it will go largely to the managers of the roads."

Marietta & Pittsburgh.

This company filed, August 7, with the Secretary of State of Ohio, the necessary papers to enable it to construct branches to the main line, described as follows: Northwest Extension, from a point on the main line in Liberty township, Guernsey County, through Guernsey, Coshocton, Holmes, Knox, Ashland and Richland counties, to a connection with the Mansfield, Coldwater & Lake Michigan road, at Mansfield; the McConeville Branch, from a point on the main line near Point Pleasant, Valley township, Guernsey County, through Guernsey, Noble, Muskingum and Morgan counties, to a connection with the Marietta & Muskingum Valley road, at McConeville; East Fork Branch, from a point on the main line in Salem township, Washington County, to a point on the east line of Noble County, near Hafford township, Monroe County; Dexter Coal Branch, from a point near Dexter Station, Jefferson township, Noble County, up Buffalo Run; Marietta City Branch, from a point in Washington township, Washington County, through the city of Marietta to a connection with the Marietta & Cincinnati road in Harmar township.

Wells River.

The Springfield *Republican* says: "The completion of the Wells River Railroad is promised by November 1. The project of a railroad straight north through the heart of the State is very popular in itself, but people are very suspicious of its chief supporters, among whom are James K. Langdon and George Shepard, men of great wealth and influence, who disgusted the people of the town by eluding the payment of their subscription to the road now building."

Hoosac Tunnel.

The progress of the Hoosac Tunnel in July was as follows: At the east end, 129 feet; west end, 145 feet; central shaft, 109 feet. Total length opened to August 1—East end, 10,685 feet; central shaft, east, 1,019 feet; west, 339 feet; length remaining to be opened—East end, 1,133 feet; between the west end and the central shaft, 3,792 feet; total, 4,925 feet.

Athol & Enfield.

From the report presented at the annual meeting, held August 6, we find that the receipts from October 1, 1871, to July 1, 1872, ten months, were as follows: From freights, \$15,607; passengers, \$9,416; express, \$723; mail, \$1,312; total for ten months, \$27,058. In the same time the expenditures reached \$22,699, leaving the net earnings of the ten months \$4,358, not enough by \$12,442 to pay the interest on the bonds of the road during that time. The capital stock was reported to be \$700,000. The road is doing a small business, but the directors expect greatly increased receipts as soon as the connection with Springfield is made.

Quincy, Missouri & Pacific.

This company has recently received eight or ten car-loads of splice-bolts, etc., and last week was taking up the road about eight car-loads of iron daily, and 45 car-loads were sent across the Quincy bridge to the road August 6. The track is to be laid to Kirksville, Mo., 25 miles west of the recent terminus at Edina, by the 1st of September. If sufficient material is received, work will be prosecuted from the western as well as the eastern end. A new locomotive was received last week.

Connecticut River.

This road is now supplying all its local trains with the Westinghouse brake. The Vermont Central is about to adopt this brake also, but the through trains of the Connecticut River road cannot be supplied with the brake until the Passumpsic River road also adopts it, as the cars of those Vermont roads all run over the Connecticut River road to Springfield.

Union Pacific Land Sales.

The sales of the Land Department of the company for the month of July, 1872, were 40,339 30-100 acres, amounting to \$139,897.03, at an average of \$4.41 per acre. The total sales from July 28, 1869, to the present date are, 601,559 6-100 acres, amounting to \$2,533,367.58, at an average of \$4.21 per acre. This is something less than a thousand square miles—enough to make a large county of 25 ordinary townships.

Manchester & Keene.

A meeting of the directors of this road was held at Keene, N. H., August 6, at which steps were taken for the early survey, location and construction of this road. The offices of the road will be established at Keene, and the books for subscription to the capital stock opened at once. The road will be operated by the Boston & Lowell and Nashua & Lowell railroads on terms which guarantee six per cent. upon the capital stock.

Boston, Nashua & Acton.

The contractors have begun work on the Nashua section of this road.

Michigan Lake Shore.

The iron is now being laid between Monteith, Allegan County, Michigan, and Mansfield, Ohio, and the cars, it is said, will be running in the fall.

Niobrara & Northern Nebraska.

Work on this road has been suspended, partly on account of the increase in the price of iron.

Chesapeake & Ohio.

The engine house of this company, at Staunton, Va., was destroyed by fire on the morning of July 31. The building was of wood and contained five new locomotives, which were partially destroyed. The loss was estimated at \$20,000.

Rio Grande Railroad.

This road, which is to run from Brazos Santiago to Brownsville, Texas, about 30 miles, has the grading all complete and six miles of track laid. The ties are all on hand and the track will shortly be ready for travel. This is in the extreme southern point of Texas.

Toledo & Southwestern.

The survey of this road was commenced July 31 by Chief Engineer O. Howard. The Commissioners of Lucas County have advertised for proposals for constructing the road through that county. The present survey is for the final location, and the contractors are to begin in 30 days.

Chicago, Dubuque & Minnesota.

Trains are now running on this road as far north as Albin, 93 miles from Dubuque, and 11 miles north of the recent terminus at Lansing. To complete it to La Crescent, 24 miles of track must be laid, which is to be done by September. The new line of the Milwaukee & St. Paul from La Crescent to Winona will complete the river line to St. Paul, by which the distance from Dubuque to St. Paul will be 247 miles, from Clinton to St. Paul 307 miles (all on the river bank), and from Chicago to St. Paul, by way of Dubuque, 435 miles, the distance by way of Milwaukee being 409 miles. The Milwaukee & St. Paul, however, will probably not encourage a business by way of Dubuque.

Wisconsin Central.

The contracts now made by this company with different parties call for the completion of 15 miles by September 1; 20 miles more by September 15; 20 miles by November 15; 20 miles by December 1; 20 miles by June 1, 1873, and 20 by October 1, 1873, which will give the company 205 miles of road from Menasha to Ashland.

Alabama & Chattanooga.

The Madison (Ala.) *Gazette* says that it is reported that negotiations are in progress for the sale of this road by the State of Alabama to a company of English capitalists, who wish to use the road as an outlet to large tracts of coal and mineral land, which they are about to buy.

Gulf, West Texas & Pacific.

This road extends from Indianola, on the Gulf of Mexico, to San Antonio, where it will connect with the International road. The length of the road, when completed, will be 143 miles, of which 38 miles were complete at the commencement of this year, and 30 miles more are under contract to be completed in November next. A branch from Cuero to Austin, 85 miles, is projected. The road passes through a very fertile section of country.

Painesville, Warren & Pittsburgh.

A correspondent of the Cleveland *Herald* says that the surveys of this proposed road are complete, and gives the following account of the line:

"The survey, as made, shows the distance from the dock line at Fourth street, in Fairport, to the Ashtabula, Youngstown & Pittsburgh track, in Austintown, to be 22 miles and 1,150 feet. The summit, three miles west of Austintown, is 278 feet above the lake. The maximum grade is less than 40 feet per mile, and can be reduced to 33 feet at a moderate cost. The curves are as follows: At R. M. Johnson's farm, 9 deg.; at Perry Station, 14 deg.; at Madison Station, 19 deg.; and at a point three miles east of Madison, 54 deg. Another line, to be surveyed hereafter, will reduce the distance to less than 22 miles, and avoid the two curves at Perry and three miles east of Madison."

Chicago, Clinton & Dubuque.

Engineers are surveying a route for the proposed extension of the road from Dubuque to Burlington. The surveying party has reached Davenport.

Chicago, Dubuque & Minnesota.

A party of engineers are surveying a line for a branch road to run from the junction of this road with the Iowa Pacific in Fayette County, through New Hampton, Chickasaw County, to Maokato and New Ulm, in Minnesota.

St. Paul & Sioux City.

A surveying party has begun to survey a line from Crystal Lake, 12 miles above Mankato, south to the State line. The line will probably run through Blue Earth City. It is reported that this is preliminary to the building of a branch road in the direction stated.

Sioux City & St. Paul.

Ground has been broken and work commenced on the new machine shops at Sioux City. Mr. Joseph Wall, of Sioux City, is contractor for the stone and brick work.

Lake Superior Steamers.

A recent letter from Sault Ste. Marie to the Pittsburgh *Commercial* contains the following:

"Two years ago the steam fleet of Lake Superior was about as follows:

Steamers running from Buffalo.....	3
Steamers running from Cleveland and Detroit.....	4
Steamers running from Chicago.....	5
Steamers running from Canada.....	2
Total.....	14

"This year it is as follows:

From Buffalo and Erie.....	11
From Cleveland.....	4
From Chicago.....	4
From Canada.....	6
Steam barges.....	6
Total.....	31

"While this shows a large increase of steamers connected with the Lake Superior fleet, the increase in tonnage is still larger, inasmuch as there have been steamers added whose carrying capacity is much larger than those of two years ago. But largely as steamers have increased, the addition of sailing vessels is considerably in advance, as far as tonnage is concerned, and it may be safely stated that the tonnage of vessels engaged in the Lake Superior trade has increased 200 per cent. in two years. The increase is caused by the large demand for the iron ores of Lake Superior, the completion of the railroad from Duluth to St. Paul, the discovery of silver on the North Shore, and the work on the Northern Pacific Railroad."

Chicago, Dubuque & Minnesota.

A thousand tons of iron for this road—enough for about 11 miles of track—arrived August 5.

Davenport & St. Paul.

The track was laid as far as Hopkinton, Iowa, August 5. Hopkinton is ten miles north of the recent terminus at Monticello, and eighty miles northwest of Davenport. With the branch from Eldridge to Maquoketa, the company now has 112 miles of road in operation.

A party of the officers of the Indianapolis, Bloomington & Western road passed over this road, August 7, going up the road to Hopkinton and also over the branch to Maquoketa. The object of the trip was to inspect the road previous to accepting it, and to select a site for the repair shops.

Utah Mining Railroad.

There is talk of constructing a branch of the Utah Southern over a very difficult country to the Emma and other mines. It would be about 15 miles long, and have nearly a uniform gradient of 240 feet to the mile, with many very sharp curves.